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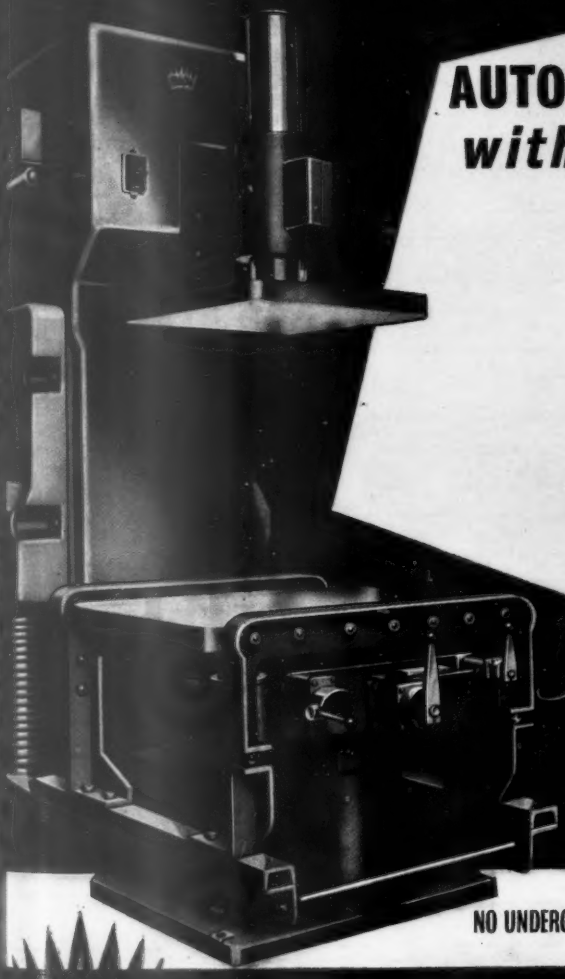

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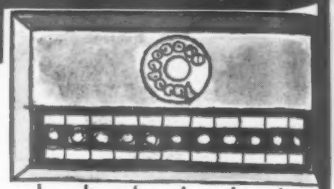

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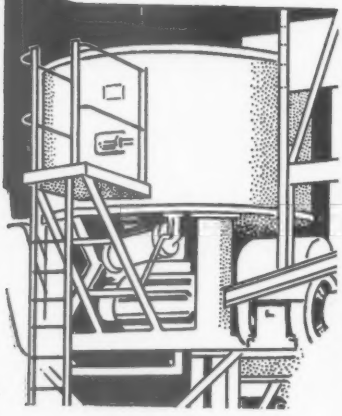
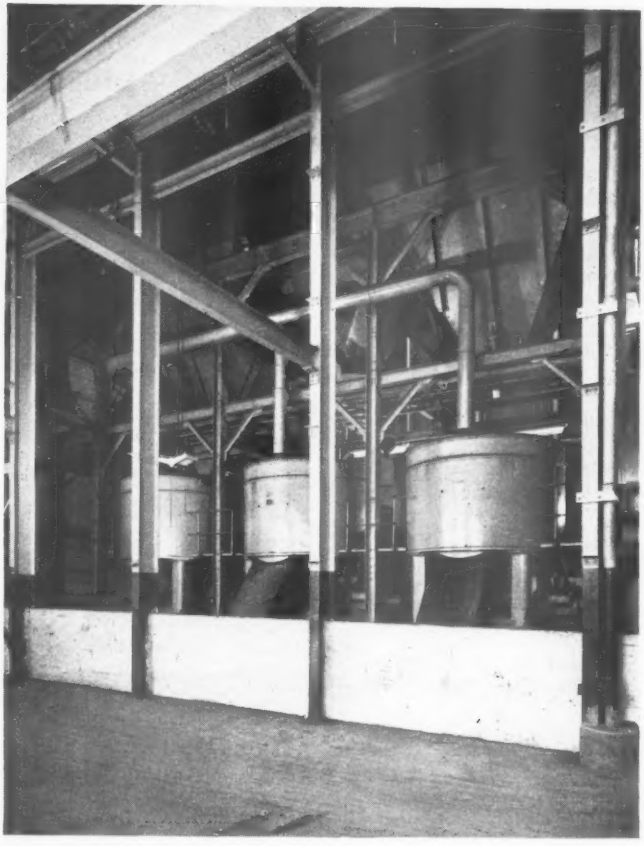
SAND MIXING EFFICIENCY..

IN A LARGE IRONFOUNDRY

Photograph published by courtesy of The Hill Top Foundry Co., Ltd. Wednesbury





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FOUNDRY
TRADE JOURNAL

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Aluminium Motor-car Engines

The Gray Iron Founders Society (of America) invited to their annual meeting* Dr. R. T. Thomson and Mr. D. F. Caris of the research department of General Motors Corporation to tell them of the implications of the proposed changeover from cast iron to aluminium for the engines of future American passenger road vehicles. In pre-war days, each car carried about 2 lb. of aluminium, whilst to-day, 52 lb. is used. Now there is talk of casting the whole cylinder-block in aluminium. The American interest in increased use of light metals is due to two reasons: (1) Possibility of weight reduction and resulting improvement in efficiency, and (2) under present circumstances, pressure-die-cast aluminium engines are likely to be cheaper than cast-iron. To ensure this cheapness, American motor-car manufacturers are establishing foundries quite near to aluminium-reduction plants, where the molten metal or an alloy will be taken direct from the reduction cell and transported in insulated containers directly to holding-furnaces in the die-casting foundry, thus eliminating remelting costs.

A series of suggestions were put forward by Dr. Thomson for ironfounders to pursue with a view to increasing their business, though he did not insist upon their practicability. They were: (1) Can ironfounders take hot metal directly from the blast furnace and avoid remelting in the cupola?; (2) can they pour metal from an electric furnace into moulds without entrapping slag as usually the case when a lip-pouring ladle is used?; (3) with research in new high-temperature materials, can ironfounders increase the scope of permanent moulds?; (4) what innovations can be introduced to produce thinner-walled iron castings?; (5) what can be done to improve some special property of cast iron, such as wear-resistance, damping capacity or modulus of elasticity, and (6) are ironfounders sure they can't successfully (pressure) die-cast cast iron?

Of these ideas, obviously No. 1 (use of blast-furnace metal direct for castings) is most interesting, where a foundry or group of foundries can be located near a blast furnace producing suitable iron. Though wild horses will not drag from us where it was done, direct metal—because of a break-down in the cupola plant—has on occasions been used to make runs of castings, in which the inspectors failed to detect any divergence from normal. It is not very many years ago since direct castings were regularly made in Derbyshire. Surely with a bath of liquid cast-iron, a knowledgable metallurgist and a range of ferro-alloys and inoculants, a really high-grade cast-iron could and should be produced. Most of the other questions Dr. Thomson posed point the need for farsighted research by founders into non-traditional methods; in each one there is a germ of an idea which could pay-off. The most important "germ" was "wherever wrought material produces a big pile of chips there is a potential market for cast products."

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* Proceedings summarized in this JOURNAL, November 6, 1958.

Correspondence

ECONOMIC DESIGN OF LIGHT-ALLOY CASTINGS

To the Editor of the FOUNDRY TRADE JOURNAL.

SIR,—The article "Economic Design of Light-alloy Castings" (December 18 issue) by P. A. Broadbent, will undoubtedly materially assist the designers and engineers for whom it was written to make full and economic use of the advantages offered by castings in aluminium and magnesium alloys. Some qualification of the views expressed on the heat-treatment and corrosion resistance of aluminium alloys, however, is desirable to avoid misunderstanding on the part of the potential user.

Broadbent quite rightly draws the attention of the designer to the problems introduced by the heat-treatment of castings, in particular the effect of quenching stresses on dimensional accuracy, and subsequently shows how distortion is prevented or minimized by care and skill in the heat-treatment department. It should be made quite clear that the possibility of dimensional variations resulting from heat-treatment arises only when castings are solution treated (condition W) whether or not the castings are subsequently artificially aged to the condition WP. It does not apply to castings which are simply precipitation treated (condition P). Furthermore, the small changes in dimensions which may occur on quenching when the necessary care is exercised are of little practical significance, since castings are machined after heat-treatment and for most castings the machining allowances are greatly in excess of dimensional changes due to heat-treatment. These small changes in dimensions could conceivably be significant in high-precision castings produced, for example, by an investment process and intended to be used without machining. Such castings, however, form only a minute proportion of the aluminium-alloy castings produced in the UK; most close-tolerance castings are produced by pressure-die-casting for which the problem does not arise, as it is normally impracticable to solution heat-treat pressure-die-castings.

This comment in no way invalidates the recommendations made in the Paper on the need to avoid disproportional sections in castings. Whether castings are made in ferrous or non-ferrous metals, the principles of cooling described by Broadbent are applicable and too-great differences in wall-thickness may result in the formation of residual internal stresses when castings cool in the mould or are quenched after heat-treatment. It is relevant to add, although not a direct consideration in designing a casting, that the distortion which may occur when the equilibrium of these internal stresses is destroyed by machining or subsequent service can be completely prevented by subjecting the casting to a stabilizing heat-treatment. This treatment is most commonly applied to castings to be used at elevated temperatures and to those for which even the smallest instability cannot be tolerated, *e.g.*, castings for instruments. Alloys which have been fully heat-treated suffer a small reduction in tensile properties as a result of the stabilizing treatment. Internal stresses and their limitation by good design need to be considered in castings in all materials and are not confined to aluminium alloys.

Broadbent's recommendation that light alloys require surface protection wherever steel does is certainly not applicable to aluminium alloys as a general rule. In practice, aluminium-alloy castings are used for applications involving exposure to the weather, *e.g.*, on buildings, street-lighting and other street furniture, largely because these alloys need either no applied surface protection or less-frequent maintenance than similar ferrous components. It is unlikely that anyone would advise the use of unprotected steel for such applications.

Evidence of the resistance to weathering of the more-common aluminium casting alloys such as LM2, -4, -6 and -8 is provided by exposure tests carried out by this Association. Cast samples which have been exposed for nearly 10 years in rural, industrial and marine atmospheres show only slight superficial attack which microscopic examination has confirmed has not penetrated more than a thousandth of an inch. By comparison an unpainted steel bolt, of the kind used by builders, exposed on the same stand as one set of aluminium-alloy specimens has been so severely attacked that it is barely recognizable.

Yours, etc.,
F. H. SMITH,
Technical Officer.

Association of Light Alloy Refiners and Smelters, Limited.
3, Albemarle St., London, W.1.
December 31, 1958.

Forthcoming Events

JANUARY 12

Institution of Production Engineers

Sheffield section:—"Non-destructive Testing," by Paul Fox, 6.30 p.m., at the Grand Hotel, Sheffield.

JANUARY 13

Institute of British Foundrymen

Coventry and district section:—"Training for the Foundry Industry," by W. S. Williams, 7.30 p.m., at the Coventry Technical College, Room A5.

Institution of Production Engineers

Doncaster section:—"Pressure-die-casting," 7 p.m., at the Technical College Hall.

Incorporated Plant Engineers

Manchester branch:—"Industrial Law and the Plant Engineer," by C. N. Glidewell, 7.15 p.m., at the Engineers' Club, Albert Square.

JANUARY 14

Institute of British Foundrymen

Southampton section:—Film evening. Films to be shown include "Britain's Heaviest Steel Casting"; "Production of Nickel"; "Nickel Refining by the Mond Process"; and "Nickel and its Alloys in Industry," 7.30 p.m., at the Technical College, St. Mary's Street.

Institution of Production Engineers

Preston section:—"Inspection as an Aid to Production," by W. Maiden, 7.30 p.m., at the Accrington College of Further Education, Sandy Lane.

Incorporated Plant Engineers

Dundee branch:—"Paints and Anti-corrosives," by R. A. Sim, B.SC., PH.D., 7.30 p.m., at Taypark Hotel, West Ferry.

East Midlands branch:—"A Criticism of Technical Education," by H. L. Haselgrave, 7 p.m., in the Sherwood Room, County Hotel, Theatre Square.

Combustion Engineering Association

Northern region:—"Mechanical Handling, Storage, and Conditioning of Fuels," by W. G. Archer, 11 a.m., at the Hotel Metropole, Leeds.

JANUARY 15

Institute of Metals

"Oxidation of Metals at High Temperatures," by Dr. C. E. Birchenall, 6.30 p.m., at 17, Belgrave Square, London, S.W.1.

JANUARY 16

Institution of Production Engineers

Eastern region:—"Russian Machine-tool Industry," by N. Stubbs and P. Trippe, 7.30 p.m., at the Golden Lion Hotel, Ipswich.

Growth of Grey-iron Castings Production and Some Factors affecting it*

(*Continued from page* 10)

By Lars Villner

Last week, in the first part of Mr. Villner's paper, statistical data and production totals concerning grey-iron castings industry in various countries were recorded and commented upon. In the final section printed below, other factors affecting production are considered, and the paper concludes with some notes on employment problems in iron foundries, together with a very interesting and informative appendix.

FACTORS AFFECTING THE GROWTH OF GREY-IRON CASTINGS PRODUCTION

It has been shown that the comparatively slow growth of the production of grey-iron castings is a feature common to the countries under review. The following groups of factors are probably the most important in determining the rate of growth: (1) Technical improvements of the iron, and the methods of casting, resulting in the individual castings being reduced in weight and, consequently, a lower total tonnage of grey-iron castings; (2) competition from other materials and methods, and (3) development in industries using grey-iron castings.

Lower Weight from Technical Improvement

There are many factors which have tended to reduce the weight of the individual casting, but few which have resulted in heavier castings. The net result, of course, has been a reduction of the total tonnage of castings. This is a favourable trend because it is a result of improved foundry technique, which has made it possible for the designers to draw components which, although lighter, satisfy the demands made on them. As a result, castings are more competitive than before. Without these improvements the production of grey iron would now have been considerably lower. The most important factors which reduce the weight of the castings are probably: (1) High quality of iron; (2) better surface finish and dimensional tolerances, and (3) good design.

Quality of Iron

For several decades, the quality of grey iron has been improving. This can be seen in the standards applicable to grey iron—the values for the top quality having continually risen—now being at the stage where the tentative international standards for the highest quality iron is a minimum of 25.5 tons per sq. in. tensile strength. It is well known that acicular cast-iron, and iron with spheroidal graphite, have appreciably higher tensile-strength. This general increase in strength has meant that designers have been able to "slim" the size of castings. In many cases, the reduction in weight has probably been proportional to the increase in the nominal tensile-strength figure. If a casting is made of iron with a strength of 15.8 instead of 12.7 tons per sq. in. it will in many cases be possible to reduce the weight by 20 per cent. On the other hand, it is not generally possible to reduce the thickness of cast iron beyond certain limits and this naturally influences the maximum weight-reduction possible. A further factor is that redesign often involves increased demands on the strength of the cast piece, and the only solution is to use an iron of higher quality and sacrifice savings in weight.

No data seem to be available for any country as to the proportion of the various grey-iron qualities. Information obtained from certain of the large Swedish foundries indicates that the average tensile strength of iron used for the manufacture of machine castings is steadily rising. Three foundries reported that their production of cast iron with a tensile strength of at least 15.8 tons per sq. in. was 100, 62, and 35 per cent. respectively. Ten years ago, the quantity of high-grade iron produced in these foundries was small. It is difficult to say to what extent designers are using the new types of cast iron. It may be assumed that at present 4,000 to 5,000 *tonnes** of s.-g. iron are produced in Sweden, or about one per cent. of the total grey-iron production. The corresponding figure in the USA is 1.1 per cent. It is probable that production of ductile iron will rise and that it will be used on an increasing scale.

Surfaces, and Dimensional Accuracy

A further factor contributing to the saving of weight is that it is now possible to produce castings with better surfaces and more accurate dimensions than those produced only a few years ago. Improvements in traditional casting methods have been the main factor. However, as regards new methods, *e.g.*, shell moulding, the extent to which they are employed is still very limited.

The *surface finish* of castings has been improved by the use of better patterns, moulding sands and moulding machines. In many cases it is now possible partly to avoid machining of the castings, which means that the weight of the casting is reduced due to machining allowances being no longer necessary.

The *dimensional accuracy* of castings has been improved considerably owing to the technical improvements just mentioned. In the good foundries, it is now possible to make castings with dimensions differing only slightly from the drawing.

* Paper presented to Liège International Foundry Congress last year. The Author is head of the foundry department of *Svergies Mekanförbund* (the Swedish Metal Manufacturers' Association).

* Throughout this paper the metric *tonne* of 2,000 lb. has been used to report statistics.

Grey-iron Castings Production

The reduced dimension variations mean reduced weight, since the designer can set the dimensions more closely, and also help to reduce machining-allowances. It may be assumed that general dimension tolerances for castings will be introduced during the next few years and, as a result, the weight will be further reduced.

Nowadays, it is possible to produce grey-iron castings with appreciably thinner walls than formerly. In some cases, the wall thickness has been reduced to less than $\frac{1}{4}$ in.—a dimension not attained a few years ago. Quite obviously, this means castings of reduced weight but, at the same time, the function of the castings is unchanged or, in some cases, improved. As an example, it may be mentioned that one foundry has been able to reduce the average weight of cast enamelled dishes by 24 per cent., and that of casings for electric panels by 27 per cent. Another factor which may possibly have played a part is the practice of selling castings by weight instead of by the piece. Ten years ago it was quite common for castings to be sold by the kilogram in Sweden, and the practice still persists. Foundrymen had no reason to keep to minimum dimensions and, in fact, were quite happy to sell overweight. However, all series-produced goods are now sold at so much per unit, and consequently the manufacturer gains by keeping the weight down.

Design

Simultaneously with changes in iron quality and casting methods, improved design has resulted in reduced weight. To-day, the strength of a machine part is calculated much more carefully than formerly. The modern methods of testing, with the help of strain gauges, vibration-measuring devices, etc., permit a very efficient use of the strength of the grey iron. The material is also distributed in the cast piece in such a way as to obtain optimum strength. In this way the advantages of casting, compared with other methods of shaping the metal, are fully utilized.

Just how much a casting can be reduced in weight by more efficient design is difficult to determine. Only seldom is a cast component redesigned without improved performance. To give an example, a Swedish company redesigned a series of boilers and achieved a saving in weight averaging 5.1 per cent. At the same time, however, the performance of the boilers was changed. Calculated on weight per sq. metre of furnace area the saving was 11.5 per cent. Ball-bearing housings with an average weight of 11 lb. were reduced in weight by 15 per cent. as a result of redesigning and were furthermore stronger, and had a better appearance.

In 1946, a certain Swedish motor-car engine contained 172 lb. of cast iron. In 1958, after a series of changes, the same engine contained 204 lb. of cast iron. In addition, the horsepower rating of the engine had been raised from 40 to 60. This meant that in lb. per horsepower the cast iron had been reduced from 2.08 to 1.55, *i.e.*, by 25 per cent. The absolute weight of the cast iron in the engine had, however, been increased by 10 per cent.

How Soon are Advances Used in the Foundries?

As has already been pointed out, there are several factors which tend to reduce the weight of the individual casting. No data exist, of course, on the total reduction in tonnage, but the Author would not be surprised if the average reduction in weight in all castings was somewhere around one per cent. per annum.

The speed at which the weight reduction is carried out depends on how quickly the old designs are revised. One can obtain some idea of this by examining the rate with which new patterns replace old ones. Some Swedish foundries state that they use patterns more than five years old only to a small extent. However, with the increasing speed of technical development, it is possible that the average life of a pattern will be further reduced. It seems at present that a technical advance in foundry technique, allowing a reduction in weight, will take at least five years to reach all the finished products, and then only if the designers have been made aware of the new possibilities. This figure is confirmed by the time that has been taken for s.-g. iron to become reasonably well established. It will soon be ten years since this iron was developed, but only during the past few years has it been used to any extent.

It may be expected that the advancement of metallurgy and foundry technology, as well as the introduction of better machines into the foundries, will have a marked effect on foundry tonnage figures in the future. This does not mean, however, that the manufacturing range will be restricted, but, that cast iron will become more competitive.

Tonnage versus *Value*

If the above observations are correct, the total value of grey-iron castings should be less affected by the slow relative decline in production than the tonnage figures. Due to the regrettable fact that the value of money is steadily decreasing in every country, it is very difficult to arrive at comparable production values for different years. However, if one uses a special method of calculation the available statistical material can give some idea of the changes in Sweden over a fairly long period. The value of castings can be compared each year with the corresponding value of the total industrial output. The comparison is then made at the same monetary value in every case. It has been found that iron castings represent about 1 per cent. of the total value of Swedish industrial production, and that this figure has remained remarkably unchanged for many years.

Fig. 10 shows the value of iron castings in relation to that of the total industrial production for the period 1923 to 1955. For several reasons, pipe and ingot mould totals have not been included in the figures. To facilitate comparisons, the figures have been indexed with base year 1923=100. It is apparent that variations in the value relation are connected with changes in the business cycle, with peaks during boom periods. The value relation has been particularly unfavourable during the past few years—a remarkable fact in view of the favourable general business trend. This is probably due to

too-high capacity, a problem which will be considered later.

The regression line shows that, in terms of value, the share of castings in total industrial production has declined by 16 per cent. during the 33-year period in question. In Fig. 10, the corresponding tonnage relation is also shown. These figures are based on the production indices for "net" grey-iron and total industrial production. The decline in the tonnage relation is obviously greater, about 29 per cent. It should be mentioned that the *ad valorem* relation contains several uncertain factors. It changes with variations in the composition of the castings production, and with long-term changes in the cost of raw materials, fuel, foundry machinery, etc. There is, however, no reason to assume that these variations are so wide that they materially alter the fact that the *ad valorem* figures have declined more slowly than the production figures, on a basis of weight. This must be due to the fact that modern castings are more complicated and sell at higher prices.

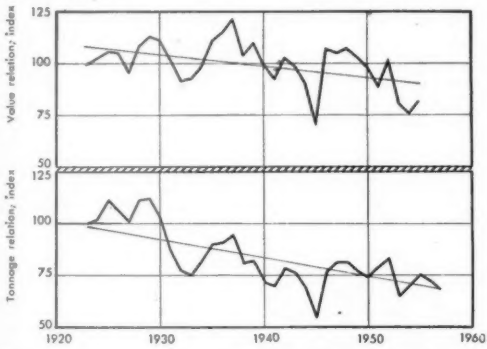

FIG. 10.—*Value of grey-iron castings in relation to value of total industrial production in Sweden from* 1923 *to* 1955 (*upper diagram*). *Index of grey-iron production in* tonnes *in relation to the index of total industrial production from* 1923 *to* 1957 (*lower diagram*). *Base year* 1923 = 100.

Competition from Other Materials and Methods

Casting, together with forging, is the oldest method of shaping metals. Up to the end of last century, cast iron was in fact the dominant material for machine parts, household articles and many other things. Bridges and church spires were made of cast iron, not to mention railings and garden furniture. Many of the materials and methods of shaping now common have gained ground at the expense of cast iron. In many cases it has not been a question of grey iron being replaced by another material, but rather of using the new material for products in which cast iron would previously have been the more or less obvious material. From this point of view, it is natural that the share of grey iron in industrial production should have been reduced, and it is almost surprising that the relative decline should have been so moderate, and so evenly distributed over a long period of time. It is beyond the scope of this Paper to deal exhaustively with all the materials and methods which compete with grey iron. Only certain actual trends will be mentioned. They are related to conditions in Sweden and may or may not be relevant in Great Britain and other countries.

The most important competitors to grey-iron castings are:—(1) welding; (2) sheet metal work; (3) forging; (4) plastics and (5) other cast metals.

Welding

Weldings are undoubtedly the most serious competitors to castings. They were accepted by industry towards the end of the 1920's and their use expanded rapidly during the following decade, and especially during the second world war. There is no doubt that weldings are used for many parts of machines and constructions which would otherwise have been made, wholly or partly, of grey or malleable iron, or cast steel.

However, this is mainly of historical interest. Nowadays foundrymen want to know whether the tendency for welding to replace casting is still strong. To illustrate the trend in Sweden the changes in the number of welders employed in the mechanical-engineering industries have been examined. Information from the employers' association shows that there were 6,900 welders in 1952 as compared with 8,500 in 1957. However, a considerable part of the increase can be assumed to have occurred in shipyards, and manufacturers of thin sheet-metal products (bodies, packings, etc.). In these particular branches of industry welding competes mainly with riveting and seaming, not with casting.

The number of welders at other companies than those just mentioned rose from 4,200 to 5,000, or by 19 per cent. (3.8 per cent. per year) during the same five-year period. The quantity of welded products has probably increased even more, since it is only fair to assume that the productivity in the welding shops has risen from year to year in the same manner as in the foundries. The rate of growth of the quantity of welded products seems to be of the same magnitude as that of the metal-products industries as a whole, and consequently considerably higher than in the foundries. For the sake of comparison, it may be mentioned that the number of workers in the main part of the Swedish foundry industry fell by 25 per cent. during the same five years. The corresponding production of castings was, however, practically unchanged.

It is not known to what extent the growth of welding depends on replacement of castings. A considerable part of the increased use of welding must be assigned to branches where welding is the best suited and consequently dominant method of production. Another part is due to the deplorable tendency of designers to prefer weldings to castings in new products. But there is still room for some changeover from cast to welded products. The Author believes that the rate of replacement now is lower than before and that, with the continual growth of mass production, where the advantages of casting are obvious, there will, in the future, be

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about as many conversions from welding to casting as there are in the opposite direction. But that can be true only if the supporters of casting advocate their products in the same superb manner as the advocates of welding.

Sheet Metal

The production of certain household articles of the cooking- and baking-dish type, meat mincers, ovens, stoves, radiators, baths, etc., was previously the privileged domain of grey-iron castings. Nowadays, many of these articles are made of thin steel-sheet. Iron castings are already in many cases replaced—or are in danger of being replaced. The reasons for this changeover are many. Thin metal-sheet is now available in large quantities and at a considerably lower price than before. The sheet quality also allows more complicated forming operations. As a rule, sheet-metal goods are lighter than cast products and a good surface-finish is easier to obtain. Finally, the greatly increased production has partly eliminated one of the major drawbacks of plastic sheet-metal forming, *i.e.*, the high initial cost of the dies.

Examples of the spheres which pressings dominate in Sweden are traffic signs, gas- and electric-stoves, heating-stoves (including oil-fired), and radiators. As regards the last item it may be added that in Sweden the heating-systems are usually of the hot-water type, and consequently the superior anti-corrosion properties of cast iron are not as important as in the case of steam-heated systems. Cast household articles (pans, dishes, etc.) offer serious competition to similar articles of enamelled- or stainless-steel, and of aluminium. By redesigning to achieve lower weight and a more attractive appearance, and enamelling in light colours, cast kitchenware has succeeded remarkably well in holding its own in Sweden.

Forging

The fields in which grey-iron castings and forged-steel compete are relatively few. Forging is, after all, mainly a competitor to cast-steel and rolled-steel produce. In those cases where the choice lies between cast iron and forged steel, it is always a question of the top qualities of unalloyed cast-iron or s.-g. iron. In view of the great cost of forging dies, the competitive power of castings can be considered as good.

As an example the case of cast, *versus* forged, crankshafts may be mentioned. For small numbers, the cost factor favours cast crankshafts, but in the case of a larger series, forged crankshafts are generally cheaper. However, when very large numbers are involved—as is the case in automobile manufacture—it is possible to develop special casting methods that make the cost of cast and forged components about the same. It then often happens that the quality aspect swings the balance in favour of cast crankshafts (high-duty or s.-g. iron).

Plastics

When employment difficulties are discussed by foundrymen it is by no means uncommon to hear the cry: "No wonder we can't sell iron castings when everything is made from plastics." In the opinion of the Author—which is of course based on conditions in Sweden—this argument is unreasonable. An analysis of Swedish production statistics for plastics articles shows that the total manufacture of such products as compete with metal is small (a few thousand *tonnes* per annum). A visit to any plastics manufacturer will show that only seldom does he manufacture products which were previously made of grey iron. The only example of any importance the Author has found of plastics replacing grey iron concerns some sewing machine parts. There may, on the other hand, be a certain amount of competition between plastics and light metals.

This does not mean, of course, that conditions will not change in future; but there does not appear to be any great danger of present-day plastics interfering seriously with grey iron. A comparison of the strength properties strongly favours cast iron, and this is also true for the prices. Against the lower weight, corrosion resistance, and sales appeal of plastics, one can set the capacity of cast iron to resist heat, its dimensional stability, and weight—the latter a factor which is often desirable.

In making this assessment of the future competition offered to cast iron by plastics the Author would, however, like to make a reservation in one case, *i.e.*, that of soil pipes. Polyethylene pipes have been reduced in price to a point where they can seriously compete with cast-iron pipes. It is, however, not yet ascertained that the durability of the plastics pipes is comparable to that of cast-iron pipes. The new type of pipes are easy to cut and weld but, on the other hand, they are inferior to cast-iron pipes with regard to resistance to both cold and heat.

Competition Between Cast Metals

It may seem unnecessary to treat competition between cast metals in this paper. After all, it generally means little to a foundryman what metal is poured into his moulds. However, when examining the trends in the development of grey iron, it is natural to examine also this particular aspect—especially since many grey-iron founders are convinced that light metals have captured part of their market.

The production of *light-metal castings* in Sweden at present amounts to 1.6 per cent. of the figure for grey iron. The corresponding values in Great Britain, Germany and the USA are somewhat higher, 2.6 to 2.9 per cent. The absolute figures are shown in Fig. 11. A direct comparison of grey iron and light metal is not possible since the difference in specific gravity is large. At a rough estimate, one can treble the figures for the light metals and the relation to cast iron will then be 5 to 8 per cent. This would, of course, be a setback for grey-iron founders if the light metals were in competition only with grey iron. However, this is by no means the case. Only sand castings and gravity-die-castings have to some extent replaced grey-iron castings. Pressure-die-castings compete mostly with plastics and pressed sheet-metal. It is therefore interesting to note that a great part of the increase in light-metal casting in recent years concerns

pressure-die-castings (USA) and gravity-die-castings (Germany). The output of sand castings, on the other hand, is fairly constant and amounts to some 25 per cent. of all light-metal castings in the USA, UK, and Germany, and about 35 per cent. in Sweden.

The world capacity for aluminium production has been extended greatly in recent years. If, as a result, the price of the ingot metal falls, it is possible that the competitive powers of light-metal castings will increase. Meanwhile, it can be said that the changeover from grey iron to light metals has been slight, the maximum being one or two per cent.

The production of *cast copper-alloys* in the countries under review is from 2 to 3 per cent. of grey-iron production. No serious competition exists to-day, or is likely to exist, between these metals—of which, from the historical point of view, cast iron appeared later (ousting bronze, which was at that time the only cast metal).

The remaining metals to be considered are *malleable iron* and *cast steel*. Malleable-iron castings comprise 4 to 5 per cent. of grey-iron castings in Great Britain, Germany and Sweden; and some 7 per cent. in the USA. The corresponding figures for steel castings are 9 to 10 per cent.; and 12 per cent., respectively. In certain spheres, the competition between high-quality grey-iron and s.-g. iron on one hand, and malleable iron and cast steel on the other, is keen. It will take some time before it is known for which purposes the different materials are best suited. It can be said, however, that s.-g. iron is making headway.

Developments in Industries using Grey Iron

The third group of circumstances which influence the growth of grey-iron production are the conditions prevailing in the industries which use castings, or products containing castings. Here, it is pleasant to record some increase in the consumption of cast iron. This is true for such branches of industry as steel, automobile, shipbuilding and building.

A reliable estimate of the future total consumption of cast-iron products must be based on a thorough study of the various uses of grey-iron castings in each of the many consuming industries, and the developments to be expected in those industries. This is a task which is beyond the Author's resources and, furthermore, a survey of this nature would be complicated by insufficient statistical data in certain important spheres. However, such a survey seems to have been made in Great Britain. The results have not yet been published and are thus not available to the Author, who can make only some general remarks on this important subject.

In the foundry statistics of most countries, the grey-iron castings are usually only summarily subdivided into the different types of casting used in the various consuming industries. For example the engineering castings, which usually account for more than half the total production, and are comprised of a variety of different types of castings, are indicated in the statistics merely as a lump total. One exception, however, is Great Britain where, since the war, excellent statistics* have been compiled on grey-iron production. It is probable the British data can, to some extent, be useful in other countries also. Where corresponding totals *are* available for Great Britain, Germany and Sweden, the percentages of the different types of castings to a large extent agree with each other.

American statistics for iron castings are also detailed, but the data exclude castings produced and consumed in the same establishment, and thus include only about 55 per cent. of the castings; consequently, they are of limited value.

A few comments on the consumption of castings in certain branches of industry will be given here. No attempt has been made to cover this wide sphere in full, and the Author hopes that the very incompleteness of the material will induce further investigations.

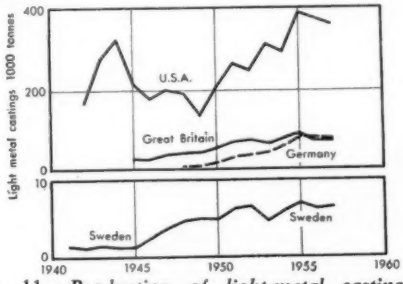

FIG. 11.—*Production of light-metal castings in various countries.*

Automobile Industry

The boom in the production of motor cars and tractors has resulted in a greatly increased demand for cast iron. The consequent increase in the consumption of castings in Great Britain is at present about 10 per cent., while the corresponding figure for Sweden is probably 8 to 10 per cent. In the USA (the home of the large and luxurious automobile), the proportion is at least 18 per cent. (see remarks above on American statistical data). It is probable that the consumption of iron castings in the automobile industry will rise even more. However, this rosy picture is somewhat darkened by the possibilities of a changeover from combustion engines to gas turbines, and by American experiments, said to be successful, in manufacturing pressure-die-cast aluminium automobile blocks.

Steel Industry

Ingot moulds are the chief iron castings used in the steel industry. The quantity is entirely dependent on steel output, and manufacture is normally confined to special foundries at the steelworks. The ingot mould consumption is generally 2 to 2.5 per cent. of the production of crude steel. In most countries steel production has risen sharply since

* Summaries of iron castings production in the UK, under 20 sub-divisions, for the years 1952 to 1957, inclusive, were printed in this JOURNAL, September 4, 1958. Figures for the years 1948 to 1951 appeared in the JOURNAL for July 31, 1952—Editor.

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the war. Consequently, the ingot mould percentage of the total grey-iron castings production has increased considerably; this is true especially in the case of Great Britain and Sweden. There has been much talk of continuous casting of steel, in which copper moulds are used instead of grey-iron moulds, but so far only a few small plants have been built. It is therefore likely that the production of grey-iron moulds will increase, not decrease.

Building Industry

The market for cast-iron pipes (both soil- and pressure-pipes) is mainly dependent on the activity in the building industries. Due to the large-scale building programmes which commenced in most countries after the war, large quantities of cast-iron pipes have been consumed, and production capacity in foundries has been enlarged to meet the demand. Cast iron is also used for boilers, baths, sanitary goods, and drainage equipment. If the standard of living continues to rise—which everybody hopes for—the quality of dwellings will also rise and the building industry will continue to be a large consumer of cast iron. The long-term prospects for foundries serving the building trade thus seem to be good.

Engineering Castings

Among the various types of castings in this large group may be mentioned castings for machine-tools; ships' engines; electrical equipment; pumps; valves, and a wide variety of industrial machinery. The development within all these spheres is heterogenous and hardly calls for any general comment. Let us therefore confine ourselves to examining what we may call the specific consumption of iron castings in other industries.

In many branches of industry, such as mining; steel; shipbuilding; shoe manufacture and, last but not least, the engineering industries, large-scale use is made of machines which embody iron castings as essential components. The production in these industries often has a sharp upward trend, much exceeding that of the output of machine castings. It would seem at first that the consumption of engineering castings ought to rise at the same rate, but this is not the case. There are two reasons for this.

First, most industrial manufacture is being rationalized and the production from a given number of machines may rise appreciably, and over quite a long period of time, without it being necessary to do more than replace worn-out machines with new ones. The result is a reduction in the consumption of castings per unit produced, in the industry in question.

Second, machines are constantly being improved. In many cases they are fitted with regulatory devices and automatic components which step up the output of the machine. Also, as a rule, these more modern machines contain cast-iron parts, and, since the machines are often larger than in the past, the weight of cast iron per machine is greater. On the other hand, certain auxiliary equipment, especially electronic devices, has increased in weight, and consequently the percentage of cast iron in them is more or less the same. However, since these new machines are much more efficient the consumption of cast iron per unit produced decreases. This reduction can be so great that the consumption of cast iron within a given industry declines, not only on the basis of units produced, but also in absolute figures.

An example of this development is presented by the foundry industry itself. As a result of rationalization, the number of working hours for machine moulders declined by 27 per cent. in Sweden between 1952 and 1957. Since every machine moulder usually has his own mouiding machine, the net result is that the number of moulding machines in operation has decreased considerably, even though production remained largely unchanged. The new moulding machines introduced have undoubtedly been heavier than those they replaced, but this has in no way compensated for the reduction in number. It can thus be said that the annual consumption of cast iron per ton of iron castings produced has declined.

Railway Equipment

The largest individual item in this group is brake shoes. Owing to the stagnation in the growth of railway traffic, compared with other forms of transport, the consumption of cast iron in the railway equipment industries has remained largely unchanged.

Consumer Goods

The most important items in this group of castings are stoves; fires; ranges; furniture castings, and domestic appliances, etc. As was mentioned earlier, many of these articles are now facing keen competition from sheet-metal products. As a result, production in recent years has either remained constant, or declined.

EMPLOYMENT PROBLEMS

In recent years, a number of Swedish iron-foundries have had difficulties in fully utilizing their capacity, both with regard to machines and personnel; and this despite the fact that the prevailing conditions in industry were generally favourable. The study that has just been presented was started to establish whether or not the employment problems in the foundries were due to a decreasing demand for grey iron. It has been shown that these fears are unfounded, since the growth in grey-iron consumption has remained constant over a long period, and there are no significant signs of stagnation. Consequently, one must seek reasons elsewhere. One possibility was that the capacity of the foundry industry had been over-tooled by the addition of new plant, or over-expansion of existing foundries. The study proved, however, that the cause was not to be sought in this direction. There remained two main ways to explain the employment difficulties, *i.e.* that the increase in production was unevenly divided between foundries; and that rapid rationalization in the foundries had resulted in excess capacity. It is not improbable that corresponding difficulties have been encountered in other countries and, since the question is one of prime importance to foundrymen.

it will be dealt with here, despite its being almost beyond the scope of this paper.

Uneven Distribution of Increase in Production

When the total production of grey-iron castings increases, the additional output is unevenly distributed over the various types of foundries. As was shown earlier, an increase in one sector may well occur at the same time as a decline in another. Foundries engaged in the manufacture of cast-iron pipes, ingot moulds, and castings for the automotive and shipbuilding industries have been fully engaged, even over-engaged; while others have seen their production figures decline. Since most foundries are equipped to produce certain types of castings only, work can be transferred from one branch of the foundry industry to another only to a limited extent. The foundries experiencing a decline in production have naturally complained about the trend of

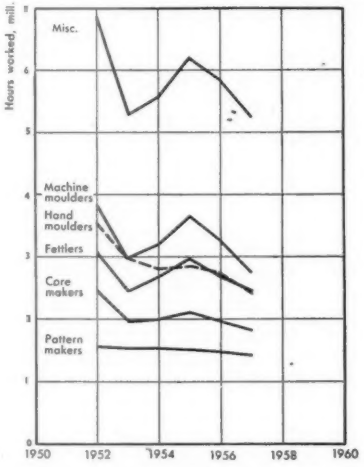

FIG. 12.—*Total working hours for different categories of workers in* 253 *Swedish foundries from* 1952 *to* 1957.

events, while other foundries, with more than enough work on their hands, have been quite content. It is possible that this has resulted in a slightly distorted picture of conditions in the industry.

Excess Capacity due to Rationalization

Sweden

During the post-war period, productivity in Swedish foundries (expressed in terms of working hours per ton of castings), has risen, on an average, by 4 to 5 per cent. per annum. Between 1946 and 1952, the additional production deriving from the increase in productivity was absorbed by a marked increase in demand. Since 1953, the market for castings has been mainly dull, both in Sweden and other countries. The rise in production has been less brisk, and at the same time productivity continued to improve at an unchanged, or even more rapid rate. As a result, production capacity rose so quickly that it could not be fully absorbed and, consequently, fewer workers were required.

This is illustrated in Fig. 12, which shows the total number of working hours for different categories of foundry workers from 1952 to 1957, in the 253 foundries belonging to the employers' association, *Sveriges Verkstadsförening*. As may be expected, the number of hours worked depends on output and, in this connection, it is found that the employment for machine-moulders, fettlers, and miscellaneous foundry workers, is more sensitive to changes in trade conditions, whilst hand-moulders, coremakers and patternmakers are less affected.

The next diagram (Fig. 13), shows the total number of working hours in these foundries and their production in *tonnes* (estimated). About 80 per cent. of this production consisted of grey-iron castings other than pipes and ingot moulds, while the balance of 20 per cent. referred to non-ferrous, malleable-iron, and steel castings. Since each *tonne* of this 20 per cent. required a greater number of working hours than cast iron, their *tonne* figures have been multiplied by coefficients between 2 and 4. The grey iron figure included is about 83 per cent. of the total production of grey iron (pipes and ingot moulds being excluded). It may be of interest to note that the production of hand-moulded castings varied between 90,000 and 100,000 *tonnes* as compared with an output of machine-moulded castings of from 150,000 to 190,000 *tonnes*. Apparently, the influence of varying market conditions is considerable on machine-moulded goods, but small on hand-moulded.

The average number of working hours per *tonne* of castings was reduced from 71 in 1952 to 55 in 1957 (Fig. 13). This is a decrease of 23 per cent. or 4.5 per cent. per annum. The production at the 253 foundries studied was about the same in 1952 and 1957. If, despite rationalization, it had been possible to retain all the workers concerned, the theoretical increase in production would have been about the same as the reduction in hours per *tonne*, that is 23 per cent. It is, of course, impossible to keep redundant labour on hand for such a long time, but the fact remains that there was a great deal of unused capacity in Swedish foundries during this period and, as a result, unemployment problems have arisen, and prices have been forced downwards.

The rationalization rate is not the same in foundries of different size (Fig. 14). A special study was carried out in respect of 54 foundries engaged solely in the production of grey-iron castings (excluding pipes and ingot moulds); their production is about 50 per cent. of the total output. The number of working hours per *tonne* of castings was unchanged or only moderately lowered in small foundries, whereas the largest foundries rationalized their production at the rate of 6.5 per cent. per annum. With the rationalization rate still low in the large number of small foundries, further reductions in the total number of working hours in the Swedish foundry industry are indicated.

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Other Countries

Whether or not rationalization measures have resulted in what can be called technological unemployment in other countries is difficult for the Author to say. Productivity data are scanty and, since the methods of calculation vary considerably, not suitable for comparisons. However, to provide some basis for discussion, which ought to be of interest to

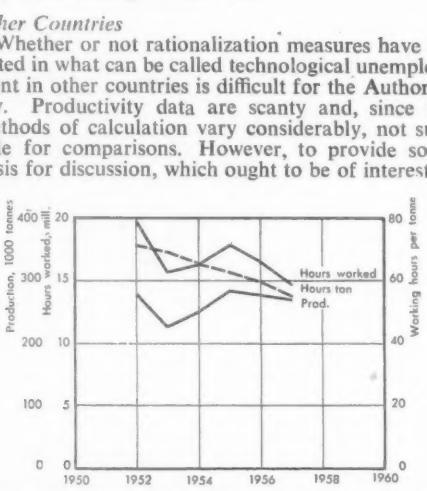

FIG. 13.—*Total number of hours worked, production of castings in* tonnes, *and rationalization rate, in* 253 *Swedish foundries* (1952-1957).

most foundrymen, the Author can supply figures based upon available statistical data. In the United Kingdom, productivity seems to have risen by about 3 per cent. per annum during the period 1952 to 1956. At the same time, production increased only slightly and, as a result, quite a large number of workers were laid off. It is therefore possible that conditions in the UK have been similar to those in Sweden

In Western Germany, the rise in productivity during the same period seems to have been nearly the same as in Great Britain, but total production rose considerably and the number of workers increased. It has not been possible to make a similar calculation for the USA, but it can be assumed that rationalization has proceeded there at the same rapid pace as earlier.

Conclusion

Even if, during the past few years, there may in some respects have been cause for misgivings about the future of the ironfoundries, available statistics show that the long-term trend of production is rather favourable, although the rate of growth is slower than that of industry as a whole. The overall picture has many encouraging aspects, in particular the technical development, high productivity, and rising quality of castings. It is to be expected that competition within the foundry industry will remain keen. However, in the long run, this will be beneficial, since it will strengthen the competitive power of castings in general. The fact that foundry growth is slower than that of industry as a whole means that it has long been defending its position. The foundry weapons in the future struggle will be high quality and competitive prices.

Acknowledgments

The Author wishes to express his warm gratitude to all who have contributed to this work. In particular, he thanks Mr. C.-G. Söderlund, *Husqvarna Vapenfabriks AB*, Huskvarna, for many fruitful and inspiring discussions; *Göran Albinsson* (Industrial Institute for Economical and Social Research, Stockholm), for indispensable statistical advice, and Mr. Sven Söderlund, *Sveriges Mekanförbund*, for valuable assistance in assembling and handling the data. Finally, he would like to thank all his friends abroad for the statistical material which they placed at his disposal. Several are mentioned in the appendix.

APPENDIX

Statistical Data

Sweden possesses the longest consecutive record of production figures, *i.e.*, from the end of the last century. German statistics date from the beginning of 1910, American production data are given from 1935, and British from 1940. Several other countries give output figures for the period since the last war (and in some cases, pre-war statistics too), but in many instances the information is incomplete. France, for example, reports only castings sold on the open market and no data are available for castings manufactured and processed within the same company. Other countries give incomplete information, or none at all, on important parts of production, *e.g.*, ingot moulds and cast pipes. As a result, no data on the total production are available.

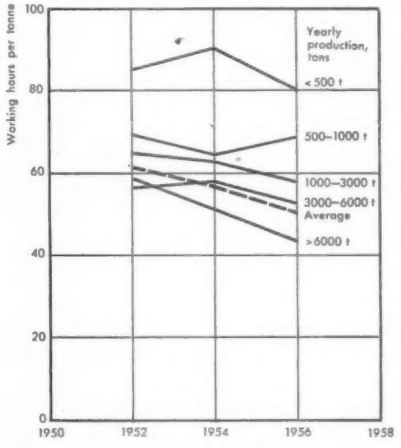

FIG. 14.—*Survey of working hours per* tonne *of castings, in* 54 *Swedish foundries of different size, in* 1952, 1954, *and* 1956.

A further complication is foreign trade. Imports and exports of castings, especially in the case of

small countries, may be comparatively important. As a rule, export and import of castings are not specified in statistics at all, or only in part. In addition, castings are often imported or exported in finished products, *e.g.*, ships, machinery and so on, in which case the quantity of castings is never registered as such. As a result, it is impossible to estimate the total industrial consumption of castings in certain countries. What foundry owners really want to know is not the production of castings, but the actual consumption of grey-iron castings, *i.e.*, the extent of the market for this product. In making statistical studies it is important that the period under review should not be too short. If it is, the influence of isolated factors, for example changes in the business cycle, can exert too great an influence.

After making all these provisos, the number of countries for which statistical analyses can be made shrinks to a mere handful, *i.e.*, Sweden, Germany, the USA and Great Britain. In the case of the USSR, some production data are available from as far back as 1913, but the structure of industrial production in Russia differs so greatly from that of the western countries that detailed comparisons of the growth of grey-iron production would be futile. Should it so happen that statistical data, previously unavailable to the Author, do in fact exist in other countries, it would be desirable to analyse the material in the same way as is described in this article. In this way the present work could be satisfactorily augmented. Sources of statistical data are listed in an appendix to this Paper.

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Sweden. Collected industrial statistics for the period 1923 to 1957. Data for 1956 and 1957 partly estimated. Data on working hours of foundry workers are given by A. Södergren, *Sveriges Verkstadsförening.*

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ASSOCIATED ELECTRICAL INDUSTRIES, LIMITED—Mr. R. Craig Wood has been elected a director. Mr. Craig Wood has been managing director of A.E.I. Hotpoint since 1956 and in this capacity he will continue to have responsibility for the domestic-appliance business of A.E.I. He is also chairman of A.E.I.-Gala, Limited, which handles the export of domestic appliances.

Acknowledged, with thanks . . .

The receipt of diaries, calendars, Christmas cards and gifts at the JOURNAL offices is gratefully acknowledged from the following:—Allied Ironfounders, Limited; A. Annis; S. G. Athanikar (India); A. P. V.-Paramount, Limited; Air Control Installations, Limited; British Steel Castings Research Association; British Oxygen Gases, Limited; BEAMA Publicity Department; J. Bell; Birlec, Limited; British Industrial Sand, Limited; British Piston Ring Company, Limited; British Nylon Spinners, Limited; Bradley & Foster, Limited; British Moulding Machine Company, Limited; J. Butler; Ph. Bonvillain & E. Ronceray (France); Barnard & Sons, Limited; British Bath Company, Limited; British Cast Iron Research Association; R. J. Bown; British Resin Products, Limited; William Cook & Sons (Sheffield), Limited; City Engineering Works, Limited (S. Africa); Catton & Company, Limited; CIBA (A.R.L.), Limited; E. M. Currie; Chamberlin & Hill, Limited; Cupodel, Limited; Coleman-Wallwork Company, Limited; Chamberlain Studios, Limited; A. Dacco (Italy); Dowsett Group of Companies; Dowty Group, Limited; E. Daybell; Davies & Baird Pty., Limited (Australia); R. C. Delpuech (France); Eyre Smelting Company, Limited; Dr. A. B. Everest; Edwards High Vacuum, Limited; Engelhard Industries, Limited, Baker Platinum Division; Electrical Development Association; Dr. O. P. Einerl; Firth-Vickers Stainless Steels, Limited; F. & M. Supplies, Limited; George Fischer, Limited (Switzerland); Frodair Iron & Steel Company, Limited; Ferranti, Limited; Foundry Suppliers, Limited; Fulmer Research Institute; Foundry Services, Limited; T. Gray; the Gas Council; General Electric Company's Publicity Organization; Globe News Service, Limited; John Harper & Company, Limited; Holman Bros., Limited; J. Hufton; Herbert Daniel Exhibitions, Limited; Vda. E. Hijos de J. Forns (Spain); W. J. Hooker, Limited; J. E. Harle (Israel); L. A. S. Harbourne; Industrial & Commercial Finance Corporation; International Alloys, Limited; International Combustion Group of Companies; Institution of Production Engineers; Imperial Chemical Industries, Limited; Institute of British Foundrymen; Incandescent Group of Companies; Joint Iron Council; K. S. Jewson; A. J. Kennedy; A. Karszon (Israel); B. Langum (Norway); M. Lorant; Leicester, Lovell & Company, Limited; Le Bas Tube Company, Limited; Mavor & Coulson, Limited; Monsanto Chemicals, Limited; Adolf Morath; Millspaugh Group of Companies; Morris Motors, Limited; H. J. Meerkamp van Embden (Netherlands); Marco Conveyor & Engineering Company, Limited; M. Olivo (Italy); Orsagos Magyar Banyasali cs Konasali Egyesulet (Hungarian Mining & Metallurgical Society); Pyrene Company, Limited; F. Perkins, Limited; Pont à Mousson; A. L. Parrott; H. Pinchin; J. Pagan (India); Premo Pattern Company, Limited; J. Rastall & Son, Limited; S. Russell & Sons, Limited; Ruston & Hornsby, Limited; Steels Engineering Products, Limited; Stewarts and Lloyds, Limited; Shell Chemical Company, Limited; Stephens Advertising Service, Limited; Sterling Metals, Limited; Scintilla, Limited; J. Stone & Co. (Charlton), Limited; Stein & Atkinson, Limited; Colin Stewart, Limited; Tube Investments, Limited; S. Thegel (Denmark); B. H. Tripp; Trucast, Limited; Union Carbide, Limited; United Engineering and Foundry Company (USA); United Steel Companies, Limited; J. Vanick (USA); John Vickers & Sons, Limited; Lars Villner (Sweden); Widnes Foundry & Engineering Company, Limited; L. A. Witham & Company; W. H. White; Dr. B. H. C. Waters; Henry Wiggin & Company, Limited; A. Wizard; E. R. Walter; A. S. Wall; T. H. Weaver; Yorkshire Engineering Supplies, Limited; Yale & Towne Mfg. Company.

Clydeside's Prospects

Shipbuilders on the Clyde are now in a position to make good use of the advantages accruing from the £20,000,000 which they have spent on modernizing their shipyards. In the New Year renewed efforts will be made to beat foreign competition, and with most of the major modernization plans on the road to completion, the Clydesiders will be better placed to compete with the Germans and Japanese, especially as they will be able to use the all-important words "early delivery" when securing new ship orders.

The main reason behind the Clyde's edge in competition has been the shortening of existing order books, enabling many yards to start work on new vessels almost immediately. Since 1951—the peak year when orders for 180 ships were placed on the river—contracts have been steadily decreasing, and this year published orders amounted to only about 18 vessels, none of which was very large. Another definite step forward to widening the scope of the world's greatest shipping river is the recent announcement of the proposal to build a £7,000,000 drydock at Greenock, details of which were published in the JOURNAL last week.

The total number of vessels put into the water on the Clyde last year was 73, six down on 1957. The total tonnages, however, show an increase—approximately 414,318, as against 373,731. The drop in orders for new vessels is causing a crisis among the small shipyards on the river, and many are at present living a hand-to-mouth existence. Mr. George Parker, Scots president of the Shipbuilding Employers' Federation, has stated that "The position of the small yards is very bad. Unless the small firms are to get more orders, they may have to pay men off." However, a large number of the men paid off recently from Clyde yards are reported to have secured jobs on the ship-repairing side.

Launchings in the river during 1958 were: John Brown & Company, Limited, three vessels, 67,973 gross tons; Lithgows, Limited, eight, 62,261; Charles Connell & Company, Limited, three, 33,694; Scotts Shipbuilding & Engineering Company, Limited, three, 31,520; Fairfield Shipbuilding & Engineering Company, Limited, two, 32,400, Harland & Wolff, Limited, three, 29,698; Wm. Hamilton & Company, Limited, three, 29,348; Greenock Dockyard Company, Limited, three, 24,536; Blythswood Shipbuilding Company, Limited, two, 23,154; Barclay, Curle & Company, Limited, two, 22,725; Alexander Stephen & Sons, Limited, four, 18,180; Wm. Denny & Brothers, Limited, four, 18,034; George Brown & Company (Marine), Limited, three, 3,959; Ailsa Shipbuilding Company, Limited, three, 3,512; Fleming & Ferguson, Limited, four, 2,377; A. & J. Inglis, Limited, three, 2,226; Ferguson Bros (Port Glasgow), Limited, four, 2,098; Yarrow & Company, Limited, five, 2,080; James Lamont & Company, Limited, two, 1,926; Scott & Sons, four, 1,039; Lobnitz & Company, Limited, two, 871; Ardrossan Dockyard, Limited, one, 707; Wm. Simons & Company, Limited, two. The figures include naval vessels but not their tonnages.

AGREEMENT HAS BEEN REACHED between the Asquith Machine Tool Corporation, Limited, and Gould & Eberhardt, Inc., Irvington, New Jersey, USA, whereby the sale and service of Gould & Eberhardt machines will be undertaken in Great Britain and Eire by Drummond-Asquith (Sales), Limited, an Asquith Machine Tool subsidiary. The manufacture of certain machines will also be undertaken by another subsidiary, Drummond Bros., Limited.

ISI Translations

From amongst the most recently published lists of translations available from the Iron & Steel Institute (4 Grosvenor Gardens, London, S.W.1), the following have been selected as being of interest to founders. The price quoted is that for single copies, postage extra, there being reductions for quantities ordered. Readers writing for translations, or for further information, should mention this JOURNAL when doing so.

1103 PETROV, I. P.: Development and Adoption of a Technique for Casting High-strength Iron. (Experience at the Syzran Hydroturbine Works). Production of High-strength Cast Iron, ed. L. I. Fantalov, Moscow, *Akad. Nauk S.S.S.R.*, 1955, pp. 192-199. (£4 10s.) (Abstr. in the *JISI*, 1958, June, p. 182c).

1108 HANSEL, F.-E.: Ergonomic Design of Driver's Cab and Control Apparatus in Cranes. *Stahl u. Eisen*, 1958, Sept. 18, pp. 1325-1332. (5.)

1150 MULLER, E. A.: Use of Reflecting Substances in Heat Protection. *Verhandl. Deut. Ges. f. Arbeitsschutz*, 1958, 5, p. 158. (£2 5s.)

Translations in course of preparation include:

1154 WEILANDT, B., and F. KRUSE: Utilization of the Sludge from Gas Scrubbers. *Stahl u. Eisen*, 1958, Nov. 13, pp. 1657-1662.

1162 EFROIMOVICH, YU. E., *et al.*: Computer for Controlling the Working Parameters of an Arc Furnace. *Elektrichestvo*, 1958, (5), pp. 15-20.

The ISI Translation Service is considering translations of the following articles (interested parties are asked (*a*) if they would like to buy a copy (or copies) of these translations if they are included in the Service; or (*b*) if to their knowledge a translation already exists):—

E 8075 Ironworks Cranes from the Working Science Point of View, by PROLINGHEUER. *Förder u. Heben*, 1958, Feb., pp. 58-61.

F 8076 Clearing up "Random Interferences" as Systematic Phenomena accompanying X-ray-fluorescent-spectroscopic Measurements and how to avoid them, by F. EBERT and A. WAGNER. *Z. Metallkunde*, 1957, Dec., pp. 646-649.

Among translations recently made available by Mr. H. Brutcher, Technical Translations, P.O. Box 157, Altadena, Calif., USA, is the following (enquiries should be addressed to him, not the ISI):—

BT 4404 WILLNER, A.: Dust Precipitation by Sonic and Ultrasonic Vibrations. *Bergbau-Technik*, 1955, (4), pp. 201-209. ($13.75.)

Glasgow Firm Expands

The Glasgow firm of Acme Wringers, Limited, manufacturers of washing machines, spin driers and other domestic appliances, has purchased the Royal Navy Torpedo Experimental Establishment building, apart from the offices, at Greenock. Mr. John Burt, managing director of the company, said that the expansion of the company's activities by the acquisition of the premises at Greenock would in no way affect production at the Glasgow factory, which gives employment to more than 1,100 people. "No one will lose his job because of this new development," he said, "and only a small number of key workers will need to go to Greenock."

Mr. Burt added that provided the Greenock premises were vacated expeditiously by the Admiralty, the company would employ about 1,000 persons there in 12 months' time. It was hoped the company would have access to part of the establishment in April, and it was intended that production should begin on a modified scale two months afterwards. The Acme company have substantial export markets in Europe, Australia and New Zealand.

Alloy-steel Ingot and Bar Production in Birmingham

In Birmingham recently, the Lord Mayor was present at the opening of a casting shop, designed for the production of alloy-steel ingots, at the works of Spartan Steel and Alloys, Limited. Although some of the largest users of rolled alloy-steel in the country have factories in Birmingham, their raw materials have hitherto had to come from outside the city, in some cases from the USA. It is hoped that this new development will save dollars, besides transport costs and time. Part of the output will go to investment founders for remelting "stock."

In the light of enquiries received by Leopold Lazarus, Limited, for special alloys, further extensions to their works at Aston, Birmingham, were clearly necessary. These enquiries were mostly for stainless-steel alloys, containing low carbon, stabilized with titanium and niobium, some of them being for "stock" for remelting by investment founders. As some firms were having to import stainless-steel products from the USA and from the Continent, new equipment was required to prepare these alloys in Birmingham and to develop facilities for the conversion of steel ingots into finished products. It was thus decided to extend the firm's main building to the full extent permitted by the city surveyor and to equip it with a 10-ton overhead crane. An electric-arc furnace was ordered from Birlec, Limited, and a liquid-oxygen plant to furnish gas for oxygen injection of steel was built. At the same time, the firm's existing chemical laboratory was extended and a new physical-testing laboratory built and equipped. To embrace these extensions, a new associated company was formed, to be known as Spartan Steel and Alloys, Limited. This new company has obtained approval by the Aircraft Inspection Directorate for its steelmaking, and for the chemical and physical testing of its products.

Buildings and Equipment

The extension to the works has cost about £150,000 and consists of a new "foundry" building, 182 by 48 ft., designed by Leonard J. Multon, F.R.I.B.A. It has a steel frame and is high-roofed, with 14-ft. brick walls surmounted by aluminium-framed glazing. The upper part of the roof is equipped with adjustable louvres, and the shop has good natural lighting and is well ventilated. The shop floor and furnace areas are served by two cranes, of five-ton and 10-ton capacity, supplied by John Smith (Keighley), Limited, Yorks. At the end of the building, there is a four-ton capacity weighbridge, and numerous brick-built bins for scrap segregation and charge preparation.

The new arc furnace for melting steel for ingot production is equipped with a specially-designed fume-extraction hood, made by Tilghman's, Limited. The melting capacity of the unit, which has a 7-ft. dia. shell, is (nominally) three tons of steel. Rated at 1,500 kva, the furnace has three 8-in. dia. electrodes which, as usual, are automatically raised or lowered to maintain correct power input and arc length. Provision is made for the furnace-roof to be lifted in its entirety clear of the shell, thus enabling scrap to be dumped directly into the furnace hearth from a charging bucket. Normal tilting gear is provided, which is interlocked with the roof swinging and lifting mechanism for safe operation.

The separate high-frequency melting installation (also by Birlec) comprises two 15-cwt. furnaces which are alternately connected to the 600-kw. supply by means of a changeover switch. Operating at 1,000 cycles per sec. from a B.T.H. motor/alternator set, they are of the magnetically-shielded type, both furnace bodies being arranged for hydraulic tilting. A 15-cwt. charge is melted here in approximately 45 min.

Stockyard equipment installed by the firm comprises a mobile K & L 6-ton capacity crane with a grab and electro-magnet; a Fielding & Platt hydraulic baling-press for scrap; a steel-turnings crusher; oxy-acetylene iron/aluminium powder scrap-cutting equipment, and Stacatrucs, etc. Outside, there is a 30-ton Avery weighbridge.

New Technical Development

The cast ingots are tested chemically and deseamed by grinding before despatch for further treatment. Finished products are subject to rigid visual, macro- and micro-examination, and are physically tested for hardness, tensile strength and impact value. These tests are carried out by qualified metallurgists and inspectors, using up-to-date equipment which includes a Denison 50-ton universal tensile-testing machine. For some time intensive research has been undertaken, embodying new ideas for the production of steel billets and bars by centrifugal methods. If successful, these ideas might revolutionize the ways of producing stainless-steel bars, and would result in metal being obtained with a much finer structure than that resulting from casting statically. Research is also being done on possible improvement of the structure of ingots by the addition of "rare" metals to the melt. The influence of rare metals on the "hot workability" of certain stainless-steel alloys is also being examined.

Specifications Produced

Stainless-steel ingots produced by Spartan Steel and Alloys, Limited, are in sizes ranging from 20 lb.

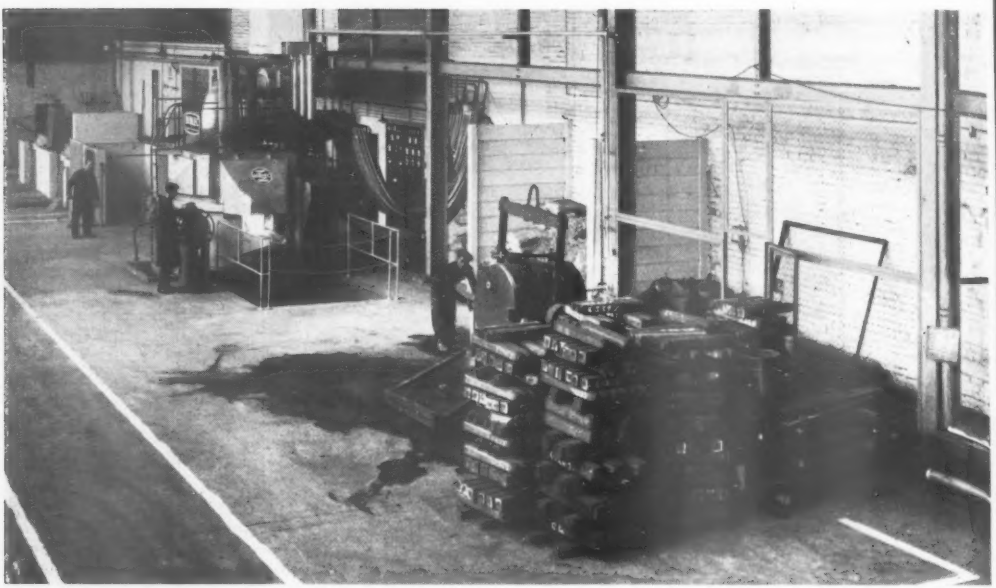


FIG. 1.—*View of the new ingot shop and melting plant of Spartan Steel and Alloys, Limited, Birmingham.*

to 3½ tons. Specifications covered are martensitic stainless-steel; ferritic stainless-steel: austenitic, and heat-resisting steel. These alloy steels are made to British EN, DTD, and S100 specifications, and to American AISI and other specifications. Martensitic and austenitic steels are also made in so-called "free-cutting" qualities. All ingots cast by conventional methods are fed by applying exothermic feeding-heads, thus ensuring sound metal free from "piping" effects.

Marking Imported Refractory Bricks

The Board of Trade announce that an Order in Council under Section 2 of the Merchandise Marks Act, 1926, providing for alternative methods of marking certain imported refractory bricks, blocks and tiles was made on December 19, 1958. This Order, the Merchandise Marks (Imported Goods) No. 4 Order, 1930, Amendment Order, 1958, which amends the original Order (S.R. & O. 1930 No. 527), prescribes alternative methods of applying the indication of origin to imported refractory bricks, blocks and tiles, not made from molten material, by enabling the indication to be durably painted or stencilled in a contrasting colour on each brick, block or tile or on the container (if any) in which it is imported, sold or exposed for sale. The Order, which came into force on December 20, 1958, also incorporates the effect of an earlier amending Order (S.R. & O. 1937 No. 720).

Origin of the Mercast Process?

The *London Diary*, on its page for January 7, 1959, reports that exactly 100 years ago, when Professor Faraday was lecturing at the Royal Institution on the properties of mercury, he solidified the metal by carbon dioxide, and made a cast of the Queen (Victoria). It would appear that the origin of the Mercast process, in which patterns of frozen mercury are used to produce precision castings, is further back in history than most people thought. A similar remark could seemingly apply to the application of carbon dioxide to foundry processes!

Money for Old Tin (Cans)

An agreement reached at Aberdeen will put over £5,000 into the Corporation's coffers between now and next July, and solve the city cleansing department's problem of storing over 400 tons of baled tins collected from Aberdeen dustbins. Carron Ironworks, Falkirk, will take delivery of 1,000 tons of baled tins from the Corporation through John Laurie & Company, scrap merchants, Aberdeen, between now and July at a price "better than £4 10s. per ton, the recently ruling price." They are also prepared to take all the baled tins Aberdeen can supply in 1959, over and above the 1,000 tons to be delivered by July. By offering a special low rate for the carriage from Aberdeen of the 1,000 tons, British Railways played a key part in solving the problem of the city's stockpile of almost 2,500,000 tins. In addition the Carron works will take the tins in present bales sizes, and the Corporation will not have to adapt their equipment to make smaller bales as was once feared.

WILMOT-BREEDEN (HOLDINGS), LIMITED, manufacturers of automobile and domestic appliance accessories, etc., of Birmingham—Ordinary and preference shareholders of December 29 are being offered 520,000 7 per cent. £1 cumulative preference shares at 20s. each, payable 5s. on application by January 26 and 15s. by February 20. The issue is the sequel to the recent capital simplification scheme. Net proceeds will be used to finance expanding production and for new buildings and plant.

New Year Honours

Awards to Personnel in Foundry, Iron & Steel and Kindred Industries

A number of people associated with the foundry, iron and steel, and allied industries feature in the New Year Honours List published last Thursday. Details of some of the principal awards, with biographical notes on the recipients, are given below.

BARON

Sir WILLIAM EDWARD ROOTES, chairman of the Dollar Exports Council, chairman of Rootes Motors, Limited, and a number of other companies in the motor industry. He has served on many official committees, Councils, and delegations, particularly those established for the stimulation of overseas trade.

BARONETS

Col. Sir ROBERT GODFREY LLEWELLYN, director of C. H. Bailey, Limited, dry-dock owners and ship-repairers, of Newport (Mon). Mr. KENNETH WILLIAM MURRAY PICKTHORN, M.P., for political and public services. Mr. Pickthorn is a director of the Westinghouse Brake & Signal Company, Limited.

KNIGHTS BACHELOR

Major-General CHARLES ANDERSON LANE DUNPHIE, managing director of Vickers, Limited, chairman and managing director of Vickers-Armstrongs, Limited, and chairman of Vickers-Armstrongs, aircraft, engineers, and shipbuilders' subsidiaries, where he has figured prominently in reorganization and development. Mr. HUBERT HULL, president of the Transport Tribunal, is a director of Ransomes & Rapier, Limited. Mr. JOHN WILLIAM LAING, president of John Laing & Son (Holdings), Limited, building and civil engineers. Dr. REGINALD PATRICK LINSTEAD, F.R.S., Rector of the Imperial College of Science & Technology since 1955 and formerly Firth Professor of Chemistry, University of Sheffield, deputy director of scientific research, Ministry of Supply, and director of the chemical research laboratory, Department of Scientific and Industrial Research. Mr. JAMES ALLAN MILNE, chairman and managing director of J. Samuel White & Company, Limited, shipbuilders, marine engineers, boilermakers etc., of Cowes. Mr. EDWARD JULIAN PODE, managing director of the Steel Company of Wales, Limited, and a director of B.I.S.C. (Ore), Limited, Guest, Keen & Nettlefolds, Limited, and the Steetley Company, Limited. Mr. Pode is a member of the executive committee of the British Iron and Steel Federation and a director of the National Industrial Fuel Efficiency Service. Mr. KELVIN TALLENT SPENCER, chief scientist, Ministry of Power, since 1954.

ORDER OF THE BATH

Civil Division

KCB

Mr. PHILLIP DENNIS PROCTOR, Permanent Secretary, Ministry of Power.

CB

Dr. WILLIAM BRIAN LITTLER, director-general of Scientific Research (Munitions), Ministry of Supply, since 1955.

ORDER OF ST. MICHAEL AND ST. GEORGE

CMG

Mr. CLIFFORD WAITE, chairman and joint managing director of Consolidated Tin Smelters, Limited, and a director of a number of companies; Mr. GEOFFREY ELLMAN-BROWN, representing the Government of Southern Rhodesia on the board of the Rhodesian Iron & Steel Company, Limited.

ORDER OF THE BRITISH EMPIRE

Civil Division

KBE

Mr. GEORGE WILLIAM HOGGAN GARDNER, director of the Royal Aircraft Establishment, Farnborough, who has directed much of the work on controlled and guided weapons.

CBE

Mr. STANLEY EDWARD CLOTWORTHY, managing director of the Northern Aluminium Company, Limited, has been actively associated with the firm for more than 30 years. He is the president of the Aluminium Development Association and has served as chairman of the sales and export committee of the Aluminium Industry Council. Dr. MAURICE COOK, chairman of the metals division of Imperial Chemical Industries, Limited, since 1950 has been chairman of the Research Board of the British Non-Ferrous Metals Association and a vice-president since 1951. Capt. NORMAN FAWCETT, chief inspector of explosives, Home Office. Mr. T. CAMPBELL FINLAYSON, M.SC., chairman of Woodall-Duckham, Limited, is a fellow of the Institute of Fuel and a vice-president of the Clean Air Society. Mr. PAUL THOMAS FLETCHER, deputy managing director, Industrial Group headquarters, UK Atomic Energy Authority, Risley. Mr. LESLIE TAYLOR MORTON, managing director of Clarke, Chapman & Company, Limited, manufacturing marine and electrical engineers, founders, etc., of Gateshead, has been with the company since 1931.

Mr. REGINALD JOHN PINDER, managing director of the Esso Petroleum Company, Limited, and a director of a number of other oil companies. Major THOMAS EDWARD PRICE, director and general manager of J. T. Price & Company, Limited, makers of fibrebricks, etc., of Stourbridge (Worcs), and of John Stevens (Stourbridge), Limited. Mr. JOHN HAYTER REED, managing director of Ericsson Telephones, Limited, and a director of a number of similar companies. Mr. REGINALD HERBERT SCHLOTEL, director of engine research and development, Ministry of Supply. Mr. JAMES MCWATERS STOREY, chairman of Jones Tate & Company, Limited, managing director of Dewrance & Company, Limited.

OBE

Mr. REGINALD FREDERICK BALLARD, general manager, Kolster-Brandes, Limited, radio engineers. Mr. ARTHUR BAMBROUGH, general manager, Richard Garrett Engineering Works, Limited. Mr. THOMAS BANCROFT, production and works director of Blackburn & General Aircraft, Limited. Mr. DANIEL LESLIE BROWN, assistant director of engine research and development, Ministry of Supply.

Mrs. DORA MILDRED CHARLTON, chairman of the Women's Advisory Council on Solid Fuel and, since

New Year Honours

1943, a member of the Domestic Fuels and Appliances Committee of the British Coal Utilization Research Association. Mr. HAROLD ECCLES, senior engineering Inspector of Factories; Mr. LOUIS ESSEN, senior principal scientific officer, National Physical Laboratory of the Department of Scientific and Industrial Research; Mr. FRANK COOK EVERETT, principal scientific officer of the Armaments Production Division, Ministry of Supply. Mr. DAVID JOHN FARRAR, chief designer, guided weapons, Bristol Aircraft, Limited. Mr. CHARLES SYDNEY JENKINS, lately regional director of the North Midlands Region of the Ministry of Power. Mr. ARTHUR EDWARD MORRISON, managing director of Moore & Wright (Sheffield), Limited, and of Avia Steel & Tools Company, Limited. Mr. PETER WILLIAM MUMMERY, senior principal scientist, reactor division of the UK Atomic Energy Research Establishment, Harwell. Mr. ALFRED RITCHIE, principal scientific officer, Scottish Home Department; Mr. THOMAS SAUNDERS ROBERTSON, principal scientific officer, Naval Construction Research Establishment, Admiralty. Major PHILIP LITHERLAND TEED, deputy director of the department of aeronautical research and development, Vickers-Armstrongs (Aircraft), Limited. Mr. HUGH NICHOLAS WOOD, managing director of Hugh Wood & Company, Limited, mining machinery manufacturers.

MBE

Mr. JOHN SHAWYER BARNES, a director and general manager of Whites Shipyard (Southampton), Limited; Mr. JOHN HENRY BAXTER, apprentice training and welfare officer, Parsons Marine Steam Turbine Company, Limited; Mr. ALEXANDER BOWMAN, dock manager, Sm.th's Dock Company, Limited; Mr. RONALD JOHN BRACEY, lately head of the optics department of the British Scientific Instrument Research Association. Mr. WILLIAM HENRY DALLY, chief engineer and supervisor of the Aberthaw Cement Works of the Aberthaw & Bristol Channel Cement Company, Limited; Mr. FREDERICK STEPHEN DENNARD, technical officer, Grade I, Atomic Weapons Research Establishment, Aldermaston; Mr. ALBERT EDWARD DENTON, works manager of S. G. Brown, Limited, makers of gyroscopic compasses and electrical instruments, of Watford (Herts); Mr. FREDERICK GEORGE DUDLEY, welfare officer of the cars branch of Morris Motors, Limited. Mr. LESLIE EDWARDS, divisional traffic manager (Western Area), British Railways, Western Region; Mr. ADRIAN CLAUDE EMERY, chief draughtsman of the telecommunications group of the Plessey Company, Limited; Mr. WILLIAM FRANK, chief engineer, Shell Tankers, Limited.

Mr. JAMES GARDNER, secretary and treasurer of the Paisley Technical College; Mr. ARTHUR GREIG, assistant secretary and editor of the Geological Society of London; Mr. IAN HENRY HOGG, a senior research planning officer, UK Atomic Energy Authority; Miss HELEN LEWIS, women's welfare officer of the Appleby-Frodingham Steel Company; Mr. WILLIAM MANSON, experimental officer, Edinburgh office of the Geological Survey and Museum Department of Scientific and Industrial Research; Mr. LANCELOT JOHN PITT, safety and civil defence officer, Fielding & Platt, Limited; Mr. JAMES RANDELL, chief ship draughtsman of John Brown & Company (Clydebank), Limited; Mr. CLIFFORD ROWLEY, assistant chief of armament design, Vickers-Armstrongs (Engineering), Limited; Mr. PERCY CHARLES RUGGLES, senior engineer of the English Electric Valve Company, Limited.

Mr. DOUGLAS SLEATH, chief draughtsman, instrument department of Laurence Scott & Electromotors, Limited; Mr. WILLIAM STEPHEN STAMBRIDGE, consultant to Rubery, Owen & Company, Limited; Mr. CHARLES STAMPS, shops superintendent, Dorman Long (Chemicals), Limited; Mr. MARSHALL DALE WHITE STONEHOUSE, distribution liaison technical engineer of the Electricity Council; Mr. ALFRED VICTOR TOMKINS, senior executive officer, Ministry of Power; Mr. GEORGE BROGAN TRESILIAN, lately chemist and metallurgist of Edward Curran Engineering Company, Limited; Mr. FRANCIS ROYAL WARNER, head of the sales department (contracts division) of the General Electric Company, Limited; Mr. WILLIAM LEWIS WIGHTMAN, member of the Tees-side District Advisory Committee of the Northern Regional Board for Industry; Mr. ARTHUR LEONARD WILSON, engineer, technical class, Grade I, ERDE, Ministry of Supply; Mr. ALBERT WINSTANLEY, manager of the smithy and metalworking section of United Glass Bottle Manufacturers, Limited; Mr. ROBERT BINNIE WITHERINGTON, works manager, Lambhill Ironworks, Limited, Glasgow.

BRITISH EMPIRE MEDAL

Mr. JAMES BALLANTYNE, chief inspector, Fawcett, Preston & Company, Limited, sugar machinery manufacturers; Mr. SIDNEY HERBERT CLAUDE BELL, chargehand, research and experimental mechanic (carpenter), UK Atomic Energy Authority; Mr. SAMUEL COUCH, head foreman coppersmith, Vickers-Armstrongs (Shipbuilders) Limited. Mr. JOHN FORSTER, leading-hand fitter, alkali division, of Imperial Chemical Industries, Limited; Mr. JOHN GRUNDY, grinder, Joseph Lucas (Electrical), Limited; Mr. WILLIAM GEORGE HARRIS, bricklayer instructor, Rotherham College of Technology; Mr. ROBERT HILDITCH, head foreman shipwright, Harland & Wolff, Limited; Mr. ARTHUR HENRY HUNT, general foreman, the British Thomson-Houston Company, Limited; Mr. CLIFFORD KENT, security officer and fire officer, British Belting & Asbestos, Limited; Mr. ARTHUR VICTOR LUSH, chief warder, Geological Survey and Museum, Department of Scientific and Industrial Research; Mr. WILLIAM MCKAY, foreman tester, Drysdale & Company, Limited; Mr. CHARLES MEIKLE, electrical instrument tester, the Record Electrical Company, Limited; Mr. GEORGE WILLIAM NICHOLSON, valve shop foreman, Richardsons Westgarth & Company, Limited; Mr. LAWRENCE OWEN, toolroom fitter, Blackburn & General Aircraft, Limited; Mr. JAMES PLUNKETT, sample passer, Dorman Long & Company, Limited; Mrs. HANNAH SALTER, winding supervisor, Rotax, Limited; Mr. FRANK SHAW, assistant foreman, outside engineering department, Cammell Laird & Company (Shipbuilders & Engineers), Limited; Mr. HERBERT SMALLBONES, machine-shop inspector, Taskers of Andover (1932), Limited; Mr. WILLIAM THACKRAY, hardener, G. Ibberson & Company, Sheffield; Mr. ARTHUR JAMES WITHEY, tool designer, J. W. Singer & Sons, Limited.

C. A. Parsons to build Giant Turbo-generator

Worth "well over £4,000,000," a contract for the construction of the largest turbo-generating unit yet projected in this country has been placed with C. A. Parsons & Company, Limited, Newcastle-upon-Tyne, by the Central Electricity Generating Board. The generator, together with its condensing and feed heating plant and main boiler feed pump, will be installed in the new Thorpe Marsh power station, near Doncaster.

The turbo-generator—a two-shaft machine—will operate two alternators of 275,000 kw each, giving a total capacity of 550,000 kw. The driving power will be steam at a pressure of 2,300 lb. per sq. in. and a temperature of 1,050 deg. F. Generation voltage will be 18,000 volts at 3,000 r.p.m. Direct-gas-cooled rotors will be used on the alternators, and these will operate with a hydrogen pressure of 45 lb. per sq. in. The stators will be cooled with demineralized water which will circulate through the conductors.

JOHN BROWN & COMPANY (CLYDEBANK), LIMITED—The secretary, Mr. A. N. Benson, has been elected a director.

Employers' Liability for Injuries caused by Falling Materials

By "Barrister-at-Law"

The responsibility of contractors to take precautions for the safety of their employees while engaged in building and engineering operations, was considered by the Court of Appeal in the recent case of Bailey *v.* Ayr Engineering and Constructional Company, Limited, and Another. In this case the plaintiff (an electrical-installation engineer), was employed by electrical sub-contractors to fix wires inside an open brick-shaft in a building which was in process of construction. There were a number of other contractors on the building engaged in various kinds of operations.

The shaft was designed to carry not only the electrical wiring, but also the gas piping and the plumbing for the service of the various floors. The shaft was not completely constructed; it ran up to the fifth floor, where it was built up like a parapet to a height of 18 in. above that floor. The opening of the shaft, therefore, was not flush with the floor level. The top of the shaft was uncovered.

The plaintiff was working in the shaft bringing up the electric wiring, and he was at a point somewhere between the ground and first floors; at the time, there was no one working on the fifth floor. While the plaintiff was so engaged, employees of another contractor (who was made a second defendant to the action) were in process of taking up to the fifth floor a section of iron railings, to form part of the staircase railing. The latter raised the section from outside by a pulley and brought it into the building at the fourth floor, with the object of manhandling it to the fifth floor. In the process of this last stage of this operation, they lost control of the section which struck the top of the shaft and broke a considerable part of the masonry which fell down the shaft and injured the electrical-installation engineer. The plaintiff brought an action against both his employers and the other contractor, who were held liable for the negligence of their employees. The principal question in the Appeal was as to the liability of the employers of the plaintifl. It was urged that they were liable for negligence at Common Law and also for breach of the Building (Safety, Health and Welfare) Regulations, 1948.

Common-Law Obligation

It is quite clear that at Common Law an employer is under the duty of taking reasonable steps so as to prevent his workmen from being exposed to unnecessary risks while engaged on particular operations. It was suggested that the employers failed in their duty, since they should either have put a cover over the top of the shaft or else put up warning notices.

This contention depended on the answer to the question whether a prudent employer would have reasonably foreseen the likelihood of objects falling down the shaft and injuring the plaintiff while he was working there. The Court considered that such a supposition could not have been reasonably expected on the part of the employer.

The top of the shaft was above floor level, so that loose materials and objects could not easily slip through into the shaft. Nor was there any reason why the employers of the plaintiff should have anticipated that some one was likely to drop articles through the shaft, much less to knock down some of the masonry and cause it to hurtle down. The happening of such an event could not have been reasonably anticipated, even though the fact of the raising of the railings in the manner described became known.

There was, therefore, no liability at Common Law.

Breach of Regulations

It next became necessary to consider whether or not there was a breach of Regulation 90(1) of the Building (Safety, Health and Welfare) Regulations, 1948. According to that Regulation, "any *place on the site* of the operations at which a person is *habitually* employed shall be covered in such a manner as to protect any person who is working in that place from being struck by any falling material or article."

"*Place on the Site.*" Two points arise under this Regulation. First, what is the "place" to which the Regulation refers when it speaks of it being one at which any person is habitually employed? Secondly, what is meant by "falling material or article"? As regards the "place," the Regulation is not defining the *person* to be protected. The point in issue therefore in the above case was not whether the plaintiff was habitually employed at that particular place, but whether the "place" was a "habitual" place of employment, where men would work, not casually, but habitually. The question was one of degree, but on the facts, there was little doubt that the place where the injured workman was engaged at the time was a "place on the site of the operations" within the meaning of the Regulations.

The shaft was intended to be used for electrical wires, gas piping and water pipes, and that would entail the various tradesmen concerned going from time to time into the shaft to carry out their particular operations.

Falling Material. It was necessary, however, to establish next that the falling masonry constituted a "falling material or article" for the purpose of the Regulation. Obviously the types of material contemplated were falling articles such as scaffold or building materials, tools, bricks and debris and the like. The material had to be something intrinsically of a chattel nature; it would not include

Employers' Liability for Injuries

material that had become part of the structure itself and had been affixed to the freehold. The material in this case was of the latter character, since it was until its detachment part of the structure itself.

Collapse of Structure

As the Court pointed out, Regulation 90 was designed to give protection to workmen working at sites from falling materials and debris of the kind referred to but not from a collapse of the structure itself, such as a chimney or roof, or as in this case a shaft. It was not as if the plaintiff had been hit by a hammer or a loose brick falling down the shaft.

The second limb of the Regulation accordingly was not satisfied, with the result that the plaintiff's employers were held not to be liable. At the same time, the question would, it seems, be one of degree. Thus, dislodged masonry after a lapse of a certain time interval might well be regarded as meriting the description of debris, and if the piece of masonry had been left lying about, and later happened to fall down the shaft and injure some one, it would, it seems, be regarded quite properly as "falling material or article."

Industrial Development in India

Under the Indian Industries (Development and Regulation) Act, 1951, a number of firms in India have been granted licences for the establishment of new industrial undertakings, the expansion of an existing undertaking and/or the manufacture of a new article. Particulars of these firms have been given in a Board of Trade Special Register circular, GEN/3789c, November 11, 1958, and the following information concerns those firms which have been granted licences during the period April to June, 1958.

Khandelwal Ferro Alloys, Limited, Khandelwal Bhavan, 166, Dadabhai N. Road, Bombay, have been authorized to produce 30,000 tons of ferro-manganese per annum, and Serajuddin & Company, P-16 Bentinck Street, Calcutta, 1, have been granted a licence for the production of 8,000 tons of low-carbon ferro-chrome per annum, 2,000 tons of high-carbon ferro-chrome and 5,000 tons ferro-silicon. Sanction for the production of iron castings has been received by Motivala & Natakar, Off Haines Road, Bombay, and Samla Collieries, Limited, 33, Netaji Subhas Road, Calcutta, in the former case for 240 to 300 tons per annum and in the latter, 6,000 tons. Steel forgings of up to 484 tons per annum may also be produced at Samla Collieries.

AS THE RESULT of technical negotiations and tests extending over four years, models of Nu-Swift fire-extinguishers have now been approved by the West German Government. This is reported to be the first time that British-made extinguishers have been approved for sale and use in the Federal Republic. Since 1941 it has been a penal offence to sell, or offer for sale, in Germany, any extinguishers which have not been examined and approved by the *Amtliche Prüfstelle für Handfeuerlöscher* (the Government testing station for hand fire-extinguishers).

International Units of Measurement

The existing differences between the values assigned to the yard and the pound (avoirdupois) in different countries have been discussed by the directors of standards laboratories in Canada, New Zealand, the United States, the United Kingdom, South Africa, and Australia, and to secure identical values for each of these units in precise measurements for science and technology, it has been agreed to adopt an international yard and an international pound having the following definitions:

The international yard equals 0.9144 metre;
The international pound equals 0.453 592 37 kilogramme.

It has also been agreed that, unless otherwise required, all non-metric calibrations carried out by the laboratories concerned for science and technology on and after July 1, 1959, will be made in terms of the international units as defined above or their multiples or submultiples.

The new international units conform with the recommendations of the Board of Trade Departmental Committee on Weights and Measures Legislation (the "Hodgson Committee") but the Board of Trade point out that *the units will have no statutory force in the United Kingdom and may not be used for trade purposes in this country*. The yard and pound units to be used in trade are the imperial units laid down in the Weights and Measures Act, 1878.

The values of the yard currently in use in the British Commonwealth and the United States of America are as follow when expressed in terms of the metre:—

One imperial standard yard = 0.914 397 2 metre
One Canadian yard = 0.9144 metre.
One yard as at present used by the National Physical Laboratory for science and technology, based on the 1922 value of the imperial standard yard = 0.914 398 41 metre.
One United States yard = 0.914 401 83 metre.

With regard to the pound, the values currently in use when expressed in terms of the kilogramme are:—

One imperial standard pound = 0.453 592 338 kilogramme.
One Canadian pound = 0.453 592 43 kilogramme.
One United States pound = 0.453 592 4277 kilogramme.

The agreed international values of the yard and the pound fall between the existing United States and British units, and the international yard, which is the same as the Canadian yard, accords exactly with the relationship one inch = 25.4 millimetres, which is already extensively used in this country and abroad for approximate conversions. The adoption of the international values of the yard and the pound will be of particular benefit to all those concerned with accurate measurements of length and mass for scientific and technological purposes in the British Commonwealth and the United States.

More UK Goods can be exported to Poland

Negotiations between Polish and UK Government representatives have resulted in the drawing up of quota lists covering two-way export trade during 1959. The new quota lists come under the three-year trade agreement signed on December 31, 1956.

They provide for UK exports to Poland during 1959 of goods such as machinery, machine tools, instruments, and consumer goods, at about the same level as in 1958, and for increased exports of chemicals, manufactures of rubber, electrical equipment, etc. Increases of some Polish exports are also provided for.

Duplexing Steel for Casting

Two weeks ago, in the December 25 issue of the JOURNAL, abstracts were given of four of the papers presented at the AIME Electric Furnace Conference at Detroit. A further and final abstract is given below from a paper entitled "Split-heat Techniques" by Gordon J. Pride, who is plant metallurgist, Canadian Unitcast-Steel, Limited, Sherbrooke, Quebec, Canada. In the United Kingdom, the term "duplexing" is usually applied to this sort of operation:

Steel castings of special specifications, beyond the range of ordinary mild steels, are often ordered by the customer in lots too small to make an economical melting-furnace load. An ideal method of overcoming this problem, by practical means, is that of splitting heats, or ladle mixing.

Oxide Control and Deoxidation

The addition of from 6 to 12 pellets of aluminium shot per 40 lb. of steel is effective in controlling this deleterious oxide. The most difficult "alloy" ladle-mixing to do is a simple carbon increase. Carbon dust is poured into the stream just after the bottom of the pot is covered by the molten metal. This must be done carefully; the rate of addition should be consistent and end just before the last of the molten steel is poured.

Intermediate Manganese Steel

To make the intermediate manganese steels, the additions are calculated with the manganese content of the base heat in mind. The carbon content of the ferro-manganese must also be considered, for this carbon is rarely lost.

Chromium-Molybdenum (4100) *Steel*

The first requisite for this is a hotter than usual heat. The steel must be tapped at not lower than 1,705 deg. C. Chromium and molybdenum as ferro-alloys are added, along with carbon, into the metal stream. A 5 per cent. by weight loss of ferro-alloy addition is estimated for chromium, but no loss for molybdenum.

Low-alloy Nickel Steels

The addition of nickel shot to make either the 4300 or the 2300 series is made in the same manner as above, there being no loss of nickel.

Precautions

Segregation

Heavy additions of nickel, chromium, and molybdenum are likely to result in troublesome segregations that become difficult to dissolve. This condition, if it occurs, can be overcome by a high-temperature solution heat-treatment.

Ferro-vanadium

Ferro-vanadium additions are generally small and no trouble has ever arisen in using this alloy.

Overalloying

If a pot is returned for a second fill, there invariably remains in the pot some metal from the previous mix. Two methods of controlling this are effective. The first is to ingot the remaining metal. An alternative method is to calculate the addition for the lower part of the range. Then, the increase of alloy content will not exceed the specification, provided a limited number of pots is required to complete the pour.

High-manganese Steel (*Austenitic*)

High-manganese (12 to 14 per cent.) steel of a consistently accurate carbon and manganese content, seldom if ever out of specification, is produced by pot mixing in a surprisingly simple manner. If the addition is calculated for 15 per cent. manganese steel, the final analytical range is 11.75 to 13.20 per cent. To make this steel, a small amount of the base heat is poured into the mixing ladle, molten ferro-manganese is then poured in, and the ladle then filled to the weight required from the base heat. By this method, mixing is completed almost instantaneously.

Cast-iron Altar . . . . *By C. J. Robb*

Altars have been made of many materials, including gold, silver, marble and wood, but rarely has cast iron been used in their make up. One notable example, however, is the altar which was cast in iron at the Armagh Foundry, in Ireland, in 1848. It so happened that in those days there was no Roman Catholic church attached to the military barracks at Charlemont, so the commanding officer had one of the gun sheds fitted up for use as a chapel, and an order was placed with the aforementioned foundry for a cast-iron altar to measure 6-ft. long by 4 ft. to the top of the table or mensa. An iron tabernacle was also ordered. When completed, the frontal panel of the altar was of fine cast-iron lacework having corner pilasters and IHS set in the centre. Red baize was introduced behind the delicate iron tracery and had the effect of displaying the ironwork to good effect. A shelf or gradine behind the table carried six candlesticks which were also cast in an ornate pattern in iron and gilded. The table was painted white with five red crosses and the rest of the ironwork was black. This altar continued in use until 1856 when the barracks was closed down.

Lancashire Steel Raises Dividend

Recovery from an earlier setback is reflected in the group profits of the Lancashire Steel Corporation, Limited, for the year to September 27, 1958. The dividend is being effectively raised to 14 per cent. by the declaration of a special 2 per cent. interim for the current year. This is payable with the recommended 8 per cent. final for 1957-58, which makes 12 per cent. (as previously) for that year and will not be taken into account when considering further dividends for 1958-59.

Group manufacturing and trading profit, including investment income, etc., is £2,985,989, compared with £1,901,826 for 1956-57 and with the 1955-56 figure of £2,985,652. The profit is struck, as previously, after depreciation and reserve for replacement of fixed assets. After heavier tax the net income is £1,235,989, against £901,826 in the previous year and £1,465,652 for 1955-56.

MONOTYPE CORPORATION, LIMITED—Mr. J. Matson, a director and general manager, has been appointed managing director.

Notes from the Branches

South Africa

The possibility of forming a Natal section was discussed at a meeting, in October, of the South African branch of the Institute of British Foundrymen, held at the Killarney Hotel, Durban. Mr. R. C. Cross, branch president, who presided, said much interest was being shown in establishing the new section; already 17 applications for membership had been received, and he understood there were several more to come. He gave an assurance that the branch Council would give every assistance in supporting Institute activity in Natal. Mr. Steele, secretary, said that those joining the new section would be eligible to enter for the branch competitions, diplomas and awards, but, he said, before forming such a section, the Institute was anxious to ensure that the necessary local support would be forthcoming for the various functions. It was, therefore, proposed that there should be a trial period of approximately one year, and initially that there should be a minimum of 50 members. In the meantime members would be included on the roll of the South African branch, and then later transferred as a complete unit to the new section.

The following members were then appointed to serve on a provisional Natal section committee, with instructions to appoint their own chairman: Mr. A. W. Bird; Mr. A. Johnston; Mr. H. G. Merryweather; Mr. A. Patterson; Mr. F. Rice; Mr. J. Robertson; Mr. D. Russell; Mr. T. Snyman and Mr. G. L. M. Thomson. Mr. John Richmond was unanimously elected as secretary.

During the meeting there was a film show, the film being "Flow of Metal into Moulds," kindly loaned by the Meehanite Corporation of Africa.

The thanks of the meeting were accorded to Mr. Richmond who had arranged the meeting, to the president and secretary, and to the projectionist who had that day travelled 150 miles to be present. The vote of thanks was carried with acclamation.

Final Meeting

The final meeting for 1958 of the South African branch was held in Pharmacy House Auditorium in November. The subject for the evening was "Billets and Bessemers" and the lecturer, Mr. H. McC. Lawrence, described in a very practical manner the establishment of his company's steel-melting plant when they were faced with the following question: "We have a third of an acre of spare ground; can we produce a continuous supply of specification steel on 13,000 sq. ft. of land economically, and with a minimum of technical staff, and is the space provided sufficient to house a complete plant together with a modern laboratory, raw-materials bunkers and change-houses for the staff?" Mr. Lawrence stated that, although the answer initially was "No," after some serious thought on the subject, numerous discussions and reference to books dating back to 1863, his company decided to start on the project with a target of 400 ingot tons per month.

The author reported that in the new plant the ingot-casting bay, 225 ft. long, was served by a gantry-crane system and consisted of two 5-ton electric units with a span of 23 ft. The equipment for melting was a 42-in. dia. acid-lined cupola and two 3½-ton side-blown Bessemer converters, and the cupola installed was charged with a skip hoist, loaded from a modified concrete weigh-batching machine, the dial of the machine being fitted with coloured indicators which marked the exact position required for the weights of each part of the charge in the correct sequence. This weigh plant was mounted on rails, and five African labourers could load one ton every 12 minutes.

Laboratory Equipment

To ensure that information regarding the metal melted was up-to-the-minute, it was necessary that the one-man laboratory should produce 50 assays per day, and bearing in mind that steel was being made at more than 6 tons per hour, the apparatus in this department was only decided upon after the closest scrutiny. Keeping one eye on the budget and the other on the necessity for rapid determinations it was decided to equip the laboratory with an AB Alpha Carbometer for carbon, a Ströhlein furnace for the determination of sulphur, and a further piece of Ströhlein apparatus, named "Nick" after the inventor, for phosphorus determination.

A semi-automatic, electric balance by Becker, and a suite of automatic pipettes and burettes completed the main portion of the equipment in the laboratory for chemical analysis. A Hounsfield Tensometer was purchased for the various physical tests required and although the tiny test pieces (1⅝ in. by ¼ in. dia.) were machined to close limits, using firm tools the bars could be made in a centre-lathe in a matter of minutes. The results obtained compared very closely with figures recorded on standard equipment using larger sizes of BSS test-bars.

Cardboard models made to scale of the ingot moulds and "fall out" were constructed before building, to ensure maximum use was made of available floor-space and by this method ultimately 12 sets of S-plates were laid out for bottom pouring. The bottom runners for the S-plates were made using the CO_2 Process. The best production from this plant to date has been 50 tons of ingots in a nine-hour shift.

Mr. Lawrence's lecture was supplemented by a series of coloured slides and at its conclusion a 16-mm. colour film he had produced was shown, which depicted the complete operation from the loading of the cupola-charged materials to the final stripping of the ingots from the moulds. At the conclusion of an interesting discussion, Mr. R. C. Cross the branch president, called on Mr. R. T. Rounce to propose a vote of thanks, and this was heartily accorded.

Northampton Section

"Moulding with the CO_2 Process in a Jobbing Foundry," was the title of a paper delivered by Mr. J. Hird to the Northampton and district section at a meeting in October at the Plough Hotel, Northampton. The paper was a very interesting account of the adaption of a comparatively new process to the jobbing foundry, with little expense but with much ingenuity in making the necessary equipment.

In adopting CO_2 practice as a substitute for dry-sand moulding, Mr. Hird said production at his foundry had been increased because of the quicker turn-round of boxes which had been effected, and another advantage was that semi-skilled labour could be employed. He went on to say that a large proportion of the work in hand at the foundry comprised small and medium-size lathe-beds, the moulds for which were now built up completely from slab cores made in CO_2 sand. To guard against "run-outs," the cores were assembled into a moulding box filled with green-sand. As to coreboxes, Mr. Hird said that many of those used at his works were wooden ones which had seen a fair amount of service, and so gave difficulty in stripping when employing the orthodox method of gassing the

core in the corebox. Therefore, a variation of this practice had been instituted which consisted of stripping the cores in the green state (or partial gassing where sag was expected to occur), then loading them into a chamber where a number were gassed simultaneously. This method had shown considerable advantage by reduction of the amount of gas employed, and it had also been found that 50 per cent. air could be used instead of all CO_2 gas.

Other Details

Provision of an electric-resistance-type heater and a circulating fan in the gassing chamber was another expedient which had been introduced to give a harder core. Here the author made some interesting comments on the possibility, in CO_2 practice, of using very much cheaper sands than the conventional ones. He pointed out that the very big cores made in his foundry did not give rise to any concern in relation to adequacy of dry-strength, this could not always be said in foundries using much smaller cores in lighter castings.

The lecture was illustrated with a series of excellent coloured slides, prepared from photographs taken by Mr. Hird himself. Members showed their appreciation of the lecture by passing a vote of thanks to the author for his able demonstration of the way in which advantage had been taken of the CO_2 Process at Rudge Littley & Company, where Mr. Hird is foundry manager.

Course on Cupola Melting

As already briefly announced, a series of lectures dealing with basic principles, practice and developments in cupola melting will be given in the Industrial Metallurgy Department of Birmingham University from March 23 to 25. The following details of the programme have now been received:

Monday, March 23, 2 *to* 5 *p.m.*: "Introductory Servey," by Mr. L. W. Bolton (Morris Motors, Limited), and "Designs Instrumentation and Ancillary Equipment," by Mr. J. D. Hill (J. Gardom, Limited); *Tuesday, March* 24, 9.30 *a.m. to* 1 *p.m.*: "Coke," by Mr. S. Spray (Stanton Iron Works Company, Limited); "Cupola Charging," by Mr. A. A. Timmins (British Cast Iron Research Association); and "Linings and Water-cooling," by Mr. D. Fleming (Textile Machinery, Limited); *Tuesday, March* 24, 2 *to* 5 *p.m.*: "Cupola Operations," by Mr. F. Dunn (BCIRA), and "Cupola Reactions and Metallurgy," by Mr. H. J. Leyshon (BCIRA); *Wednesday, March* 25, 9.30 *a.m. to* 1 *p.m.*: "Hot-blast: Engineering Aspects," by Mr. W. J. Driscoll (Cupodel, Limited), and "Hot-blast: Metallurgical Aspects," by Dr. G. J. Shaw (Fuel and Metal Processes, Limited).

The fee for the course is £2 2s. and those wishing to attend should make application to the secretary, Department of Industrial Metallurgy, The University, Edgbaston, Birmingham, 15.

LANDMASTER, LIMITED, Hucknall, Notts, a member of the Firth Cleveland Group, announce the formation in Australia of Landmaster Pty., Limited. It is also announced that Simmonds Aerocessories Pty. Limited, the Australian subsidiary of Simmonds Aerocessories Limited, of Treforest, another member of the Firth Cleveland group, will manufacture at Ballarat the range of "Gardenmaster" rotary cultivators and ancillaries, for Landmaster Pty. Limited.

American Letter

Scrap Consumption Falls

It is clear there is the same dilemma in America, concerning export of scrap; as that which exists in the UK (see JOURNAL, December 11, 1958). About 18 months ago Congressional hearings were in progress concerning the rapid exhaustion of scrap iron and steel. The participants, representatives of the American scrap, and iron and steel industries, debated whether to curtail scrap exports to conserve "natural resources." There was an annual export increase of six million tons in consumption, and prices were high, being at times approximately equal to pig-iron prices.

Since then, however, dealers have been "buried" in scrap, with supplies on hand equal to two or three months' needs, and purchasers have been taking about 30 per cent less than they did a year ago. The annual rate of of scrap consumption (66 to 72 million tons), dropped to about 50 million tons in 1958 (see Table 1).

TABLE 1.—*Approximate Annual Totals and Prices of American Scrap Iron and Steel.*

Year.	Tons.	Average price (dollars per ton).
1956	72,000,000	65·00
1957	66,000,000	35·00
1958	50,000,000	42·30

The iron and steel foundries have reduced their requirements by about 20 per cent., in conformity with the reduced rate of casting production (see Table 2).

TABLE 2.—*Iron and Steel Foundries' Approximate Scrap-consumption Totals.*

Year.	Tons.	Average price (dollars per ton).
1956	12,000,000	51·00
1957	11,000,000	48·00
1958	9,000,000	45·00

Exports

Meanwhile the export market has experienced a 50 per cent. slump in the tonnage of scrap exported. Indeed, some countries are taking even less than 50 per cent. of their former requirements; Great Britain, for example, has stopped purchasing scrap altogether (see Table 3).

TABLE 3.—*Analysis of American Scrap Exports (Tons).*

Country.	1957.	January to September 1, 1958.
Belgium-Luxembourg..	227,000	21,360
Canada	665,000	276,000
France	207,500	124,800
West Germany ..	589,000	127,000
Italy	1,422,000	760,000
Japan	2,120,000	403,000
Mexico	294,000	201,000
Spain	91,500	53,700
United Kingdom ..	331,000	—
Total (including other destinations) ..	6,150,000	2,010,000

Totals for the two preceding years are: 1955, 4,460,000; 1956 5,550,000.

Prices are low, about 45 dollars per ton, and no sudden revival in the market is expected. Dealers are reconciled to the notion that "things can't get any worse."

News in Brief

JOHN LUND, LIMITED, Eastburn Foundry, Crown Hill, Keighley, Yorks, has been granted permission to plan extensions to the premises.

INDONESIAN FOREIGN MINISTER, Subandrio, stated recently that the Canadian Government is to provide 40 Indonesian students with the opportunity to follow engineering courses in Canada.

WORTH £100,000, an order for a 1,500-ton hydraulic forging press has been placed with the Davy & United Engineering Company, Limited, Sheffield, by another Sheffield company, Brown Bayley Steels, Limited.

AN AGREEMENT has been concluded by the British Brush International Company, Limited, with the Jordan Government to construct an electric power station at Akaba. The cost is estimated at £103,000.

WEST GERMANY'S production of crude steel for 1958 is expected to total 22,800,000 tons, compared with 24,500,000 tons in 1957. Current annual rate of output is 22,000,000 tons, compared with total capacity of 27,000,000 tons.

AN ORDER has been secured by Ruston & Hornsby, Limited, Lincoln, for diesel engines and pumps worth over £250,000 from Egypt. Some of the engines and pumps will be used for irrigation work and others for industry and marine craft.

BRITISH THOMSON-HOUSTON COMPANY, LIMITED, announce a reduction in price with effect from December 22 1958 of electric motors type KFB of 2, 4, 6, and 8 poles up to 25 h.p. The motors are to be reduced in price by 10 per cent.

AT THE INVITATION of Bilston Foundries, Limited, members of the staff of John McLean & Sons, Limited, builders, Coven, Staffs, last month inspected the works at Bilston. In the morning they were taken round the older foundry and in the afternoon they inspected the new mechanized plant for bath making.

BRADFORD FIRE BRIGADE was summoned to the works of Hepworth & Grandage, Limited, engineers, Bradford, on the night of December 22, to stand by while a furnace containing molten metal was emptied. They had been called after workmen had found a "run out." The metal was transferred successfully.

THE CHEMICAL PLANT division of Power-Gas Corporation, Limited, has recently received an order for two Pease-Anthony scrubbers to treat gases from zinc-sintering plant at the Swansea works of the National Smelting Company, Limited. They remove micron and sub-micron sizes of dust and mist.

BY EXCEEDING its 1958 steel production target of 10,700,000 tons China has become the world's seventh largest producer. According to the New China News Agency, steel production for the year was expected to top the 11,000,000-ton mark. Compared with 1957 output has more than doubled. Target for this year is 18,000,000 tons.

ROTHERHAM EDUCATION COMMITTEE last month asked the Director of Education, Mr. R. Bloomer to convene a meeting of employers, and trade unionists, to consider the recommendations on the recruitment and training of young people in industry in the Carr Report. Local problems will be discussed with a view to promoting action by industry.

ALL CUTLERY, HOLLOWARE and flatware for passengers on the new Union Castle liner R.M.S. Pendennis Castle has been made in Sheffield. Every item of the Westminster and Athenian patterns of Mappin Plate was hand-finished by craftsmen at the works of Mappin & Webb, Limited, Sheffield. The liner sailed on her maiden voyage on January 1.

THE SCOTTISH EDUCATION DEPARTMENT has informed the governors of Dundee Institute of Art and Technology that the block grant for 1958-59, in respect of maintenance expenditure, will be about £183,000. The governors have approved estimates, showing expenditure of £209,035 and an income of £27,450; the balance of £181,585 is to be met by grant.

CONSOLIDATED SALES of the United States Borax & Chemical Corporation in the year ended September 30, 1958, surpassed all previous records. Sales of boron products continued to rise, but potash sales were down compared with the previous year. Net income amounted to $2,370,314 on sales of $53,057,764, compared with $5,470,931 on sales of $50,987,907 in the previous year.

Mr. D. L. PALMER-LEWIS, general manager of W. & T Avery, Limited, Smethwick, presented the awards to apprentices at a ceremony on December 22. The total paid in cash to the company's apprentices since the system of awards started in 1949 exceeds £1,000. This year's awards totalled £110 of which eight apprentices received £10 and six others £5 each.

SCRAP-IRON from the works and depots of Thos. Ward, Limited, at Bolton-on-Dearne, Killamarsh and Tinsley, Sheffield, was the first to be shipped through the port of Hull during the two-month lifting of the ban on its export. The first of five special train loads were loaded at the King George V Dock on December 30, in the 2,300-ton MV Falkland, for delivery to Sweden.

IT IS UNDERSTOOD, says Barclays Bank D.C.O., that work on the installation of the pilot plant of the new foundry and rolling mill at Aboso, near Tarkwa, has been suspended for a time. It is, however, expected to recommence early next year. The Bank also says that the Ghana Scrap Metal Buyers' Association is reported to be considering an approach to the Government with a view to lifting the restriction on scrap metal exports.

A CONTRACT for the biggest single housing scheme in the history of Que Que, Southern Rhodesia, has been signed between the municipality and Roberts Construction Company (S.R.), Limited, and work will shortly commence on 126 houses at Fitchlea, a quarter of a mile from the centre of the town. The area will be developed in zones, according to the demand as the scheme progresses. Loans backed by the Government of up to 90 per cent. will be available on these houses.

BRITISH RAILWAYS are building new chemical laboratories for their research department, on a site near the former Alexandra Palace Station at Muswell Hill, London, which will enable certain chemical work now being conducted at various laboratories elsewhere, to be concentrated and co-ordinated at one centre. A contract has been placed for the construction of the building, and work is in progress. It is expected that the new laboratories will be completed by the end of this year.

INCANDESCENT HEAT COMPANY, LIMITED, Smethwick, report the receipt of a £50,000 order for an annular-hearth rotary furnace and ancillary equipment to be installed in northern Italy. The furnace will be fired by the firm's Equiverse system, using natural gas; by this method, oxidation is eliminated when heating steel in a direct-fired furnace. Plants using this system are already in operation in Great Britain, France, Germany, and the United States of America. The furnace, which has a mean diameter of 20 ft., will be used for heat-

ing alloy-steel blanks for piercing in a vertical press, the first operation in the production of steel "bottles" to take liquefied petroleum gas at high pressure.

BRASS & ALLOY PRESSINGS, LIMITED, Liverpool Street, Birmingham, 9 (one of the Deritend group of companies) report a changeover in the production of essential parts for safes and strong-room equipment. The parts, including strap handles, lever handles, roses, etc., which were previously produced as sand castings and polished and plated where necessary, are now being hot pressed. It is stated that although the cost of pressings is higher than castings, subsequent economies in machining, polishing and plating prices result in a considerable net overall saving which more than justify the changeover. [Although no doubt examples could be quoted of trends exactly the reverse of that mentioned above, the citation is valuable in that it warns founders against complacency. What foundrymen may regard as established outlets for cast products may change overnight, unless quality and economics of the cast product remain supreme.—Editor.]

THE FULL BOARD OF DIRECTORS of Follsain-Wycliffe Foundry, Lutterworth, were present when they gave their 12th annual dinner for over 200 employees in the new staff canteen on December 19th. An employee, Mr. V. Hancock, proposed a toast to the company, and in reply Mr. H. A. Bonney, managing director, gave his annual report, in which he said he had to admit to a decrease in production for the first time in 12 years. Despite this, a full working week had been maintained for every employee even though there had been "anxious moments." The building of the new machine shop, mainly by their own building team, had been a good job of work, he said, and had enabled a new staff canteen to be prepared in the old machine shop. He welcomed a group of the firm's pensioners to the dinner. Mr. James Halloran, foundry manager, who retired at the end of last month after 24 years service with the company, received a silver dish from the directors and a portable radio set from his colleagues.

Dr. JOHN F. THOMPSON, chairman of the board of the International Nickel Company of Canada, Limited, in a review of the nickel industry in 1958, referring to austenitic-nickel cast-irons, said they were now available in the ductile form with much greater strength and toughness. The new ductile-types of these special irons were finding usefulness in industry as a supplement to the heat- and corrosion-resistant steels used heretofore. There had been an increased use of abrasion-resisting nickel-chromium cast-irons for grinding and crushing equipment in plants handling ores, cement, coal and coke, especially in the United Kingdom, Germany and Scandinavia. New techniques in casting and heat-treating grinding balls made of these alloys showed promise of wider adoption of these cast-irons for this application in the cement and mining industries. The use of nickel as a magnesium carrier in the manufacture of ductile iron showed an increase during the year, despite the fact that general foundry activity was hampered by the general business recession.

FULL SUPPORT was given on December 22 by Aberdeen industrial firms to the one-day work-study conference in Robert Gordon's Technical College attended by 50 apprentices and other young people. Organized by Aberdeen Productivity Committee, this was the first Aberdeen conference for young people dealing with the effective method of increasing productivity and industrial efficiency. In opening the conference Dr. West said: "If everyone, not only employers, attached some importance to the method of the work-study system by using applied commonsense it would improve production in our factories immensely." On the "Industrial Challenge," Mr. Loudon, senior lecturer of the Royal College of Technology, Glasgow, said the greatest drawback work-study officials have to face in this country is the suspicion and fear of the working people. He went on to say that "Youth has the real chance to accept the great industrial challenge of our day. We must bring this study into the system at an early age by teaching it in colleges instead of romanticising the past. Productivity is not to exploit capitalism or to make people richer—it is to give people an easier life." Dr. Alex. Wood, chairman of the committee, said that the demand for places at the conference was so great that there was every likelihood of further courses being held at Aberdeen.

Major C. R. DIBBEN, chairman of the Midland Regional Board for Industry, has denied, very definitely, allegations made by Mr. Jack Williams, engineering group secretary of the Transport and General Workers' Union, that the Board had become "nothing more than a propaganda organization for the Government and the Conservative Party." The allegation was made by Mr. Williams at the annual meeting in Birmingham, on December 4, of the Midland Regional Advisory Committee of the Trades Union Congress. Mr. Williams claimed that while the economic situation in Birmingham had worsened in recent months, the Regional Board had reported that "everything in the garden was lovely" whereas in fact the Midlands had been facing a period of great economic difficulty with a growing threat of unemployment. Mr. Williams moved that the union representation on the Board—shared equally with employers—should be withdrawn as a "mark of protest" but he withdrew this proposal when it was pointed out to him that the step would be entirely contrary to union policy. Major Dibben described the criticism as "utter nonsense." He recalled that he was appointed as independent chairman by the leader of the Labour Party, Mr. Hugh Gaitskell, who at that time was Chancellor in the Socialist Government.

AT THE ANNUAL DINNER in Birmingham last month of the Midland branch of the Institution of Mechanical Engineers, Coun. W. Semple, chairman of the branch, said that with the rate of progress in automation, Midland industry "in the not far distant future" would be able to produce about 50 per cent. more with a labour force 30 per cent. less. The timing of this accomplishment depended on the rate of factory re-equipment, he said. Referring to the link between industry and education he said that greater co-operation was vital if every advantage was to be taken of what the future offered. The Lord Mayor of Birmingham, Ald. Donald Johnston, said that the old demand for craftsmanship was being replaced by a demand for technologists, and organizations such as the "mechanicals" had to be encouraged to the full in their insistence on high standards of education and technical ability. Mr. J. Ashmore, chairman of the South Midland Centre of the Institution of Electrical Engineers, pleaded with the younger generation to take every opportunity of learning foreign languages which, he said, were becoming more important in the drive for more exports. Other speakers included Air Marshal Sir Owen Jones, national president of the Institution, who spoke on the benefits in such organizations of voluntary service, Mr. J. E. Belliss, branch vice-chairman, and Mr. J. E. Jones, chairman of the Midlands Association of the Institution of Civil Engineers.

Company News

English Electric Company, Limited

Basically to finance increasing business, the English Electric Company, Limited, is to raise just over £10,000,000 of capital by issues of debenture stock and ordinary shares. The chairman, Sir George Nelson, explains that at the beginning of December, 1958, orders in hand were about £238,000,000 and turnover during the year had been some 13 per cent. higher than was estimated two years ago. This higher turnover and the extended credit required in the export market has called for additional capital.

Although costs continue to rise and profit margins are tending to fall, states Sir George, the board views the future with confidence and expects to be able to maintain the dividend rate on the increased capital. Additional capital had been provided by bank loans, which at mid-December exceeded £20,000,000. The two issues will reduce the volume of bank money.

Profits for the year which ended December 27 are expected to be not less than the 1957 figure of £8,333,385 and the maintenance on the present capital of last year's 14 per cent. distribution by a final dividend of 10 per cent. is forecast.

Debenture and Ordinary Rights

Debenture, preference, and ordinary stockholders registered on November 21 will have the right to apply for a £6,000,000 issue of 5¼ per cent. debenture stock, 1979-84, at £97 per cent. Running yield is £5 13s. 5d. per cent., and to redemption £5 14s. 6d. per cent. Ordinary stockholders of the same date may apply for a total of 1,826,606 £1 ordinary shares at 50s. each on a one-for-10 basis. With the existing ordinary at 60s. 9d. the rights are calculated at about 1s.

Last day for applying for the debenture is January 14 with a £25 per cent. payment. A further £25 per cent. will be payable by February 17, and the remaining £47 per cent. by April 7. For the ordinary issue allotment letters and excess share applications must be delivered by January 27 with 20s. a share, the remaining 30s. being due by March 10.

SOLARTRON ELECTRONIC GROUP, LIMITED—The recent rights issue of ordinary shares was heavily oversubscribed by the existing shareholders. Together with a bonus issue, the ordinary capital of the group is now increased to £220,000.

WORSLEY MESNES IRONWORKS, LIMITED—There is a dividend of 12½ per cent. and a bonus of 2½ per cent. for the 15 months to September 30, 1958 (10 per cent. for the year). The net profit is £55,751 (£18,412) before tax of £25,176 (£10,700).

BARROW HÆMATITE STEEL COMPANY, LIMITED—The directors expect to receive shortly a formal offer for the purchase of the 5s. ordinary shares at 5s. each. If such offer is received, it will be recommended to shareholders for acceptance. There is £353,625 of ordinary in issue.

ABWOOD MACHINE TOOLS, LIMITED—The declaration of the interim dividend has been deferred until the annual accounts are available. For the year ended March 31, 1958, there was an interim of 5 per cent. followed by a similar final payment. The issued capital of £85.000 in 1s. ordinary shares was placed to the public in April, 1958, at 1s. 4½d. per share.

WOLVERHAMPTON DIE CASTING COMPANY, LIMITED—Speaking at a recent meeting, Mr. W. C. Sproson, chairman, said that the fall-off in demand from the passenger car industry was in the main due to the fact that a number of models were being withdrawn to be replaced by new ones. It had been the company's experience that this reduced demand continued until the new models came into production.

BRITISH NORTHROP LOOM COMPANY, LIMITED—The resolution increasing the company's capital has been passed by an extra-ordinary meeting. Acquisition of the share capital of the Chaseside Engineering Company, Limited, has been duly completed and Mr. Gordon L. G. Jackson has been appointed managing director of the group. The acquisition of the Chaseside Engineering Company (Canada), Limited, will be completed shortly.

H. W. KEARNS & COMPANY, LIMITED, machine-tool manufacturers, of Altrincham (Ches)—Resolutions to increase the capital to £500,000 by the creation of 600,000 5s. ordinary shares and capitalizing £150,000 from reserves in a three-for-five scrip issue have been approved. The chairman, Sir Lionel Kearns, states that the company has a perfectly adequate supply of orders to see it right through this year and, he hopes, a good deal past then. There is, he says, no reason to change the optimistic forecast he made in his statement with the accounts.

Obituary

The death occurred last month of Mr. LEWIS RHODES, chairman of Wm. Asquith, Limited, machine-tool makers, Halifax, from 1937 to 1951. Mr. Lewis was 80 years of age.

The death occurred on December 22 of Mr. GEORGE HARRY HIGGINS, a director of Alexander Higgins & Sons, Limited, mechanical engineers and ironfounders, of Lye, Stourbridge (Worcs).

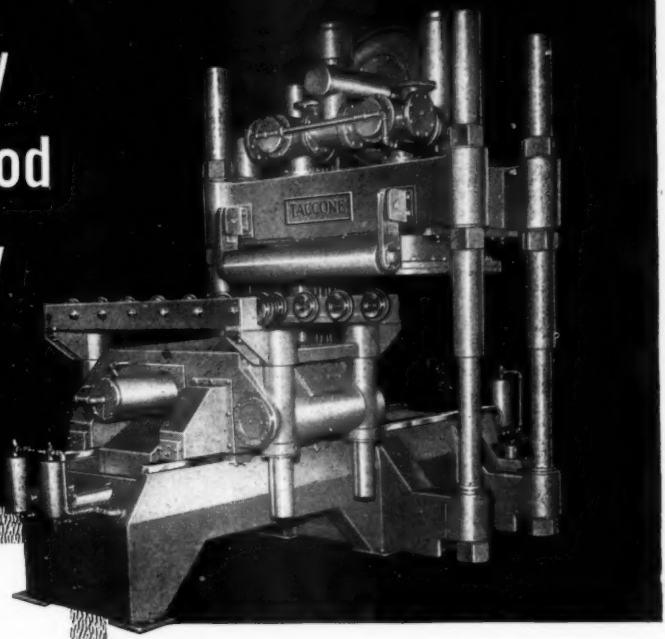
The death in Roubaix, France, at the age of 71, has occurred of Mr. ANTOINE THIBEAU, head of the Keighley firm of Thibeau (Engineers), Limited, general textile engineers, in Dalton Lane. Mr. Thibeau who first founded a textile-machinery business in Tourcoing, started the Keighley concern in 1937. He last visited the British firm about two years ago.

The death occurred just before Christmas of Mr. HENRY S. CLARK, senior partner of the old-established firm of John H. Clark & Company of Broad Lane Ironworks, Tottenham, London, N.15 — a firm specializing in the manufacture of piano frames. Mr. Clark joined the Institute of British Foundrymen in 1924 and for some years served on the London branch Council. He was 86 years of age.

Mr. ALBERT HAMILTON, founder of A. Hamilton & Sons, Limited, steelfounders, of East Moors, Cardiff, has died. He was 69. With his brother, Mr. Hamilton established the business in 1915 and in 1921 installed the first electric arc furnace. He also pioneered in South Wales the production of steel castings by this method. He was a past-president of the South Wales Association of the Engineering and Allied Employers' National Federation.

AS A RESULT of the textile depression the old-established Lancashire Dodd group of companies is to go into creditors' voluntary liquidation, and a meeting of creditors has been called for January 22. The group comprises S. Dodd & Sons, Limited, founders and textile-machinery manufacturers, Oldham; William Bodden & Son, Limited, spindle and flyer manufacturers, Oldham; and William Ryder, Limited, spindle, flyer and roller manufacturers, Bolton.

An entirely NEW method of Foundry Moulding



with the

'TACCONE' HIGH PRESSURE DIAPHRAGM MOULDING MACHINE

The 'Taccone' machine makes precision green sand pressure moulding available to every foundry. It ensures sound, accurate castings and the moulds it produces are superior to those made by conventional equipment. 'Taccone' moulds are consistently hard and uniform throughout and can be effortlessly produced by unskilled labour

All types of pattern equipment, including plaster, wooden, plastic and metal patterns can be used, and there is practically no limitation on the size of flask employed. 'Taccone' machines are handling flasks 8½t. by 8ft. (larger sizes are envisaged) and already over 200 'Taccone' installations are in operation.

The dimensional accuracy and finish on the castings is comparable with work produced by shell moulding techniques.

The 'Taccone' is more than a machine, more than a process—it is a revolutionary system for rapid mould production.

Ten standard machines are available in the manufacturing range and special machines can be built to any size for any purpose.

Please write for information

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Foundry Machinery Division
BEDEWELL WORKS · HEBBURN-ON-TYNE · CO. DURHAM
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BP/F1

Personal

Mr. R. IBISON, assistant general manager of Hawthorn Leslie (Shipbuilders), Limited, has been appointed a director.

Mr. WILFRED HUNT, M.B.E., J.P., has retired as general works manager of Ferranti Limited, Hollinwood (Lancs). He has been with the company for 52 years.

Mr. EDWIN TAYLOR, son of the managing director, and Mr. E. G. DOBSON, foreman for many years, have been elected to the board of Taylor's Foundry, Limited, Alperton, Middlesex.

Mr. GEORGE S. SANDERS, B.SC (ENG.), has been appointed head of the newly-formed group productivity services department of the Solartron Electronic Group, Limited, Thames Ditton, Surrey.

Mr. MICHAEL S. PARKIN managing director of F. M. Parkin (Sheffield), Limited, steel and tool manufacturers, is making a business trip to Australia, with a view to furthering sales of the company's products.

Mr. BRIAN COOPER, elected "Best Apprentice of the Year" at the Ecclesfield Works of Hall & Pickles, Limited, Sheffield, received an award from Mr. J. H. Russell, managing director, on December 22.

British Insulated Callender's Cables, Limited, announce the appointment of Mr. G. N. BLADES, A.M.E.M.E., as regional manager, London, in succession to Mr. E. A. SAYERS, who retired on December 31.

Mr. R. J. W. RUDKIN, general manager of the Naval Yard, and Mr. A. L. White, general manager of Palmers Hebburn Works, have been appointed additional directors of Vickers-Armstrongs (Shipbuilders) Limited.

A family association of 80 years in the employment of Ruston & Hornsby, Limited, engineers, Lincoln, has been broken by the retirement of Miss EDITH LOVATT, who has been with the company for 44 years. Her father and two brothers also worked for the firm.

Dr. J. Ramsey Gebbie has relinquished his appointment as managing director of William Doxford & Sons, Limited, but will continue as chairman of that company and of the subsidiaries, William Doxford & Sons (Shipbuilders), Limited, and William Doxford & Sons (Engineers), Limited.

Mr. H. M. McNab, Yorkshire district manager of the British Oxygen Company, Limited, presented long-service gifts to two members of the staff at a dinner in the canteen on December 24. Mr. C. SEAGER, of Sheffield, received a tape recorder, and Mr. R. A. BROADHURST, of Rotherham, was given a gold watch.

Mr. J. HORRIDGE, works manager of George Kent, Limited, Luton, since 1951 will be retiring shortly on medical grounds, and last month he was presented with a farewell gift subscribed to by all the Kent factories. Owing to the retirement, it is announced that Mr. J. F. WILLSHER has been appointed general works manager.

Mr. PHILIP B. LEVY, a director of the George Cohen 600 Group, has been elected chairman of G. Beaton & Son, Limited, in place of Mr. E. W. SENIOR. Owing to his other commitments, Mr. Senior has been unable to accept an invitation to remain as chairman of G. Beaton & Son, a company which was recently acquired by the George Cohen 600 Group.

Mr. ANDREW M. WARD, secretary of the Scottish Engineering Employers' Association since 1954, retired last month, after almost 50 years' service in Glasgow to the engineering and shipbuilding industries. Mr. Ward who was awarded the M.B.E. in June, 1957, will be succeeded by the Association's present assistant secretary, Mr. W. L. ARMSTRONG.

Dr. and Mrs. GEORGE W. BURLEY celebrated their golden wedding anniversary on December 29. Dr. Burley was formerly head of the mechanical engineering department at the Bombay Central Technical Institute, after having gained his Doctorate of Science at University College, Sheffield, and being a lecturer there in mechanical engineering. During the first world war he did research at Sheffield in connection with special steels for cutting tools.

Mr. DEREK MONNOX, aged 18, has been awarded the "Apprentice of the Year" prize at Guest Keen and Nettlefolds (Midlands), Limited, Smethwick, and is to be sent by the company to a 10-day youth conference in Germany. Mr. Monnox, a craft apprentice, is a Duke of Edinburgh Award Gold Medal holder. The company's technical training committee has decided to recommend the board of directors to increase the number of apprentices; at present there are 125.

Mr. HAROLD HUMPHRIES, managing director, Hadfields Limited, Tinsley, Sheffield, presented clocks to 36 employees of the company who have completed 25 consecutive years of service, on December 22. They automatically become members of the firm's "25" Association. Recipients included Mr. T. W. PEASE, a local director, and Mr. L. S. PELL, garage superintendent in the works engineering department. The Association now has a total membership of 1,181.

Mr. HAROLD FORREST has been appointed director and works general manager of Hepworth & Grandage, Limited, Bradford, and will be responsible to the chairman and joint managing director, Mr. G. Collin Hepworth, for all the production and foundry activities of the company. Mr. Forrest joined the company in April, 1934, as foundry manager, joining the board and becoming foundry director in 1942. In 1957 he was appointed foundry and personnel director, and has since that date done much to foster good relations within the company.

Among employees retiring from Wm. Jessop & Sons, Limited, Brightside, Sheffield, at the end of 1958 were two cousins, 65-year-old Mr. EDWIN HALL, who has been in the low side warehouse for 51 years, 38 of them as foreman, and 66-year-old Mr. WALTER SCANDRETT, engine tenter who started in 1905 on the works locomotives and has been in the fitters' department and rolling mills. They both hold the 25 years' service watch and the 40 years' service certificate. Mr. Hall was given a radio set by his colleagues and Mr. Scandrett, a barometer. Mr. FREDERICK NAYLOR, aged 65, has retired after 24 years in the research department, and was presented with a dining table by Mr. G. T. Harris, research manager.

The research and development department of The United Steel Companies, Limited, announce a number of organizational changes, which became effective on January 1. Dr. W. DAVIES, head of the minerals section, has been additionally appointed geological consultant to United Steel, in recognition of his special contributions in this field. Because of his long secondment to Barrow Steel Works, Limited, Mr. I. M. D. HALLIDAY will relinquish his interest in furnace design and will be formally in charge of continuous-casting research. Mr. C. HOLDEN is appointed head of the furnace research section, which was formerly known as the furnace design section. Mr. A. S. BABB is to take charge of a new trackwork and structures section in the department; this will form a part of the development engineering group. Mr. D. SHAW is appointed head of the newly-created electronics section.

Mr. Walter Jones is vice-chairman of the joint advisory committee at John Summers. When his health made it desirable for him to retire from the sheet finishing department (above), he was found lighter work. "We couldn't have better people to work for," says Mr. Jones.

10,000 men work at John Summers. So many come to work by car and motor-cycle that they have special labels to help the works traffic control. Over 3,000 labels have been issued.

In this works one man in three drives to the job

Trevor Evans, Daily Express Industrial Correspondent, went to Wales and found an inspiration—and a challenge.

I WISH every industrialist in Britain had come with me to the steelworks by the Dee. What I saw was an inspiration. And a challenge.

There is no reason to suppose that this place, about five miles outside the boundaries of historic Chester, is out of step with the rest of the industry.

Mr. Richard Summers, the chairman of the company, was driving me through his works when I commented how odd it was to see a car park around the corner of almost every building. Finding more space for motor-cars was going to be a problem, he said. Whose cars?

10,000 Acres

HE looked at me in some surprise. Why, he said, the people who work here. Then he explained that so big is this site – it stretches over 10,000 acres, though so far buildings, offices, mills, furnaces and coke ovens occupy only about one-quarter of the Summers' land – that every vehicle bears a special label to speed its coming and going through the patrolled gates.

There are 10,000 working here. Nearly one-third come to work in motor-cars or motor-cycles. I thought Mr. Summers was talking loosely, in general terms. He wasn't. Nearly 3,200 labels have been issued. New applications are coming in daily.

First hands at the furnaces frequently take home more than £30 a week. The odd one has been known to take home £40 at a peak period, and the average for all is £15 a week.

Expansion

MR. SUMMERS explained to me how the present production of 1,000,000 tons of steel, mainly in sheets for motor-cars, drums and such household goods as refrigerators and washing machines, would be up to nearly 2,000,000 tons a year in about three years' time. "We go ahead, whatever happens," he said.

I saw ample evidence of expansion for the future, even to reclaiming land from the tidal water by battering down the refuse from the plant, thus adding a bit more to Wales.

Peace

ONE of the most impressive men I met at Shotton was Mr. Walter Jones, leading member of the steelmen's union, and vice-chairman of the works joint advisory committee. A thoughtful, deliberate kind of man with more than 40 years' service at the plant. "We couldn't have better people to work for," he says.

Management and workers have known each other long enough. This is largely a family affair.

It was old John Summers who inspired all this. He used to make clog irons in Stalybridge, Cheshire, more than 100 years ago.

He decided to make his own nails, so he made rough steel sheets. His son, Henry Hall Summers, bought this bleak land on the banks of the Dee in the nineties of last century. And Henry's son, Richard, is now the head of the concern.

There are all sorts of joint organisations on all aspects, from production to safety and sports.

This plant, like most others in steel, has a remarkable record of internal peace. There was dispute in 1911 – between two unions. But of official strikes against the management, none at all.

What can be wrong with an industry which commands the energy and loyalty of a lifetime's service from men of pride and skill?

ISSUED BY THE BRITISH IRON AND STEEL FEDERATION

Raw Material Markets

Iron and Steel

The chief concern of producers of both pig-iron and of castings is to obtain an increase of business more in keeping with productive capacity. For some time production of pig-iron in all grades has exceeded demands, and large stocks have accumulated at the furnaces, even though there are only 84 furnaces in blast, compared with 97 a year ago.

The main decline in demand has been confined to basic pig-iron for the steelworks and to high-phosphorus foundry iron, and the decreased usage has resulted in the closing down of a number of furnaces, while others have had their outputs reduced in proportion to the demand. Outputs of hematite pig-iron have also been reduced in line with requirements. In the case of low-phosphorus irons, stringency in supplies during the earlier part of the year was overcome by the burdening of additional furnaces for the production of this grade. Consumption of these irons continues at comparatively much higher levels than other grades, but with the increased tonnages now available producers are unable to dispose fully of their makes and some are carrying fairly heavy stocks.

Producers of all grades of pig-iron would welcome an appreciable increase on present demands so as to reduce their stocks and also to obtain a more economic level of working in disposal of output. In order to ease the position efforts continue to be made by producers and merchants alike to secure more export business, but competition from makers abroad is very keen and prices are low.

Without exception the ironfounders could undertake more work. High-duty castings continue in comparatively biggest demand, and hopes are entertained of increased requirements from the motor-car industry, and of improved demands from the machine-tool industry and other users. Throughout the whole of last year, demands for light castings have been moderate and most of the light foundries have been only partially employed, while many of the jobbing and textile foundries have also been short of work. The easing of the credit restrictions has brought some increase in business and it is hoped that this will expand.

All the re-rollers are hoping for an improvement in trade. Business has been very difficult for some time, and insufficient work continues to result in short-time working. Rolling programmes are fixed on day-to-day arising of orders, and the small tonnages called for necessitate frequent roll changing.

Demands for small bars and light sections are small and on a fluctuating basis, and the recent improvement has not been sustained. The steelworks could satisfy a much larger demand than is at present forthcoming for steel semis.

Non-ferrous Metals

The strength of sterling, the continued good behaviour of Wall Street and the London Stock Exchange, and bright forecasts of a general return to better economic conditions in 1959 have been responsible for non-ferrous metal markets on both sides of the Atlantic remaining steady during the holiday period.

The copper market in London has been reasonably firm and price movements narrow. Demand from the UK and from the Continent is satisfactory and the resumption of copper shipments from Rhodesia will, it is thought, be easily absorbed. Similarly, it is felt that the remaining available stocks of copper released by the Board of Trade on the last day of the year amounting to some 26,000 tons will not affect the market unduly owing to the extended manner in which this unloading operation is being carried out. Meanwhile, stocks in LME warehouses are again declining and at the end of last week totalled 5,271 tons.

In America the unified quotation of 29 cents a pound reflects the price at which metal is being offered both by the custom smelters and by the producers. In America, the general feeling is that the present better trend of the economy will continue in 1959 which will eliminate any danger to the market of higher production rates in the US and from American-owned mines in Chile where the major part of next year's increase will come from the El Salvadore mine. Elsewhere, it may be noted that copper is once more being produced from the International Nickel Company's plant following the settlement of the Sudbury strike.

Tin has failed to recover its former strength and now that the current output quota period has begun it may take some time before the price will return to its former level. However, American metal circles are predicting a much larger offtake of metal this year than last and, if this proves to be the case, the advance in the quotation will come about sooner rather than later. Tin stocks in LME warehouses at the end of last week amounted to 15,918 tons.

Lead is without feature, but steady, and the price is showing only minor fluctuations. Barter deals are said to have involved about 15,000 tons, but even so there are still sizable tonnages available. The general opinion about the outlook for lead during the coming year is not over optimistic. World stocks are still high, and although US consumption is expected to advance in the neighbourhood of 5 per cent., this should not make a great deal of difference to the present price level, nor, indeed, will this improvement enable producers to return to full production. In the US the price is firm at 13 cents a pound.

Zinc is a better market than lead on both sides of the Atlantic. In the UK the backwardation persists and looks like widening further. The difficulty here is that spot supplies are relatively scarce and there are no signs of this position being overcome unless, of course, sizable tonnages are attracted on the London market from the Continent. In the US the price is steady at 11½ cents a pound.

BA—Further Developments

Struggle for control of the British Aluminium Company, Limited, took on a new phase when it became known last Thursday that a group of 14 leading City bankers and business houses was prepared to spend at least £7,000,000 to prevent control of the company passing to Tube Investments, Limited. The group offered 82s. in cash per £1 unit for up to half the stock owned by ordinary holders subject to certain conditions. Assurances were given that no stock acquired would be sold to the Aluminium Company of America (Alcoa) and that no funds from that company are connected with the offer.

At the time of going to Press, Tube Investments, Limited, and Reynolds Metals, Limited, were expected to announce, following the day's business at the Stock Exchange, that they had together acquired over 50 per cent. of the ordinary stock of British Aluminium. It is understood that the first step TI means to take, once it has acquired control, will be to notify the Treasury of the position. It seems unlikely that the Treasury, having remained silent for so long, will intervene at the last moment, but it would be rash to assume anything about its decision until it is promulgated.

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Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

January 7, 1959

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2: Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £23 17s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £24 1s. 3d.

Scotch Iron.—No. 3 foundry, £25 3s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 19s. 0d.; South Zone, £26 1s. 6d.

Refined Malleable.—P, 0.10 per cent. MAX.: North Zone, £27 6s. 6d.; South Zone, £27 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.: N.-E. of England (local iron), £25 6s. 6d.; Scotland (Scotch iron), Zone S.1, £25 13s. 0d.; Sheffield, £26 15s. 0d.; Birmingham, £27 4s. 0d.; Wales (Welsh iron), £25 6s. 6d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £41 0s. 0d. to £43 10s. 0d., scale 15s. 0d. per unit; 75 per cent. Si, £56 10s. 0d. to £60 10s. 0d., scale 15s. 0d. to 16s. 0d. per unit.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 10d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 8s. 6d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 11s. 6d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £77 0s. 0d. to £81 0s. 0d., basis 60 per cent. Cr, scale 26s. 0d. to 27s. 6d. per unit; over 6 per cent. C, £74 10s. 0d. to £77 10s. 0d., basis 60 per cent. Cr, scale 26s. 0d. to 27s. 6d. per unit; 2 per cent. C,* 1s. 7¼d. to 1s. 10¼d. per lb. Cr; 1 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 0.15 per cent. C,* 1s. 9d. to 2s. 0d. per lb. Cr; 0.10 per cent. C* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.06 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £265 0s. 0d.; 96/98 per cent., £295 0s. 0d.

Ferro-columbium.—65/72 per cent., Nb + Ta, 19s. 9d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £73 0s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., £32 15s. 6d.; tested, 0.08 to 0.33 per cent. C, £33 15s. 6d.; hard (0.41 to 0.60 per cent. C), £34 17s. 0d.; silico-manganese, £43 16s. 6d.; free-cutting, £36 14s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £42 2s. 0d.; boiler plates (N.-E. Coast), £44 12s. 0d.; floor plates (N.-E. Coast), £43 11s. 0d.; angles (N.-E. Coast), £39 16s. 6d.; joists (N.-E. Coast), £39 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, £50 tons and over, £40 0s. 6d.; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, £39 0s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £44 16s. 0d.; black sheets (hand mill), 24g., £58 14s. 6d.; galvanized corrugated sheets, 24g., £67 10s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £68 10s. 0d.; nickel-chrome, £99 11s. 0d.; nickel-chrome-molybdenum, £111 19s. 0d.

NON-FERROUS METALS

Copper.—Cash, £224 10s. 0d. to £224 15s. 0d.; three months, £223 15s. 0d. to £224 0s. 0d.; settlement, £224 15s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 2d. per lb.; rods, 235s. 6d. per cwt. basis; 20 s.w.g., 270s. 6d. per cwt.

Tin.—Cash, £756 10s. 0d. to £757 0s. 0d.; three months, £757 10s. 0d. to £758 0s. 0d.; settlement, £757 0s. 0d.

Lead (Refined Pig).—First half January, £73 7s. 6d. to £73 10s. 0d.; first half April, £73 0s. 0d. to £73 5s. 0d.

Zinc.—First half January, £75 10s. 0d. to £76 0s. 0d.; first half April, £73 0s. 0d. to £73 10s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £110 2s. 6d.; rolled zinc (boiler plates), all English destinations, £108 7s. 6d.; zinc oxide (Red Seal), d/d buyers' premises, £95 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 9½d. per lb.; sheets to 10 w.g., 190s. 9d. per cwt.; wire, 2s. 6½d.; rolled metal, 190s. 9d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £144; B6 (85/15), £195; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £184; HTB2 (38 tons), £199; HTB3 (48 tons), £200.

Gunmetal.—BS1400, LG2 (85/5/5/5), £178; LG3 (86/7/5/2), £188, G1 (88/10/2/½), £248; (88/10/2/1), £239.

Phosphor Bronze.—BS1400, PB1 (AID released), — per ton.

Leaded Phosphor Bronze.—BS1400, LPB1 (1060), £201 per ton.

Phosphor Bronze Strip, etc.—Strip, 275s. 3d. per cwt.; wire, 3s. 11½d. per lb.; rods, 3s. 2½d.; tubes, 3s. 2½d.; chill cast bars: solids 3s. 2d.; cored 3s. 3d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 8½d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 1½d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 0½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 3d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £74 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £180 0s. 0d.; aluminium bronze (BS1400), AB1, £225; AB2, —.

* Average 68-70 per cent.

Changes of Name

Among companies which have recently changed their names are those listed below. The new titles are given in parentheses.

MOODYS ENGINEERS, LIMITED, Page Street, Huddersfield (Engineers Holdings, Limited).

MAUNDRELL FOUNDRIES, LIMITED, Horsebrook, Calne, Wilts (Maundrell's (Calne), Limited).

RANKEN (PLUMBING & HEATING), LIMITED, Stockton Road, Sunderland (T. & G. Hind, Limited).

ROSSLYN ENGINEERING SUPPLIES, LIMITED, 174, High Street, Hounslow, Middx (Dafiles, Limited).

MODERN PIPES & FITTINGS, LIMITED, 56, Kingsway, London, W.C.2 (Durapipe & Fittings, Limited).

ENGINEERS HOLDINGS (1958), LIMITED, 2, Cloth Hall Street, Huddersfield (Moodys Engineers, Limited).

JAMES CLITHEROE & SONS, LIMITED, Grey Street, Radcliffe, Manchester (Blackburn Foundry, Limited).

W-K-M VALVE COMPANY (BRITAIN), LIMITED, 313, Regent Street, London, W.1 (ACF (Great Britain), Limited).

D. B. ENGINEERS, LIMITED, Britannia Works, Bolton Road, Radcliffe, Lancs (Maden & Hardman, Limited).

LANCOMOTORS, LIMITED, engineers, etc., of Clough Street, Hanley, Stoke-on-Trent (Jeffreys-Lanco, Limited).

MASON & COMPANY (PRESSINGS), LIMITED, Tramway Path, Mitcham, Surrey (Vaughan & Williams, Limited).

METAL-HARDENERS, LIMITED, Metallurgical Works, Elland Road, Elland, Yorks (Moderna Heaters, Limited).

UNION FOUNDRY (LITTLE HULTON), LIMITED, Bidyard Street, Little Hulton, near Bolton (Union Foundry, Limited).

BRADES NASH TYZACK (SALES), LIMITED, Brades Steel Works, Oldbury, Birmingham (Brades Nash Tyzack, Limited).

R. C. SEAL & COMPANY, LIMITED, Abbey House, Victoria Street, London, S.W.1 (Ralph Steel Equipment (Sales), Limited).

GORDON METAL FABRICATIONS, LIMITED, Abbey House, Victoria Street, London, S.W.1 (R. C. Seal & Company, Limited).

SPRINGWELL INDUSTRIES (ENGINEERS), LIMITED, 44, Lovaine Place, Newcastle-upon-Tyne (Jos. Ostens & Son, Limited).

M. L. ENGINEERING COMPANY, LIMITED, United Building, Trading Estate, Slough, Bucks (M. L. Holdings, Limited).

AFFINIA (ENGINEERING), LIMITED, Highfield Works, Highfield Road, Blackburn (Autolifts & Engineering Company, Limited).

H. BEESLEY, LIMITED, engineers, etc., of Clarendon Park Tool Works, Avenue Road Extension, Leicester (B. & G. Holdings, Limited).

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

MANSFIELD, January 31—Supply of materials for stores required by Borough Council during the year ending March 31, 1960, include iron castings (manhole and gulley fittings) (5). Documents are obtainable from the Borough Engineer and Surveyor, Carr Bank, Mansfield: serial number should be quoted.

SCUNTHORPE, February 11—Requirements of Borough Council include castings (1). Documents from Mr. F. J. Bowyer, A.M.I.C.E., Borough Surveyor, Laneham Street, Scunthorpe.

CHELTENHAM, January 17—A supply of castings is required by the Borough Council for stores during the 12 months ending March 31, 1960. Documents obtainable from the Town Clerk.

ORPINGTON, January 23—Supply of street nameplates, and traffic signs. Documents from the Engineer and Surveyor, Civic Offices, The Walnuts, High Street, Orpington. (Applications must be accompanied by stamped addressed foolscap envelope.)

MALVERN, January 19—Requirements of Urban District Council in connection with Group "B" street lighting—phase II, include 85 cast-iron columns. Documents from Mr. C. C. Judson, B.SC., A.M.I.C.E., The Council House, Malvern. Deposit £2 2s. 0d.

PEMBROKESHIRE, January 29—Supply of cast-iron gulley gratings and frames, manhole and footpath covers, etc., required by County Council. Documents from Mr. W. Brundan, O.B.E., County Offices, Haverfordwest.

GILLINGHAM, January 19—Supply of materials required for Borough Council stores include cast manhole covers and frames (6), rainwater goods (30), and street nameplates (37). Documents from the Borough Engineer, Municipal Buildings, Gillingham, Kent.

SOUTH AFRICA, January 23—Petrol pumps. (ESB/32936/58.)

SINGAPORE, January 28—Galvanized malleable cast-iron pipe fittings. (ESB/31473/58.)

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Pig-iron and Steel Production

Statistical Summary of October Returns

The following particulars of pig-iron and steel produced in Great Britain are from statistics issued by the British Iron and Steel Federation. Table 1 summarizes activities during recent months. Table 2 gives production of steel ingots and castings in October. Table 3, weekly average production of finished steel in September. Table 4 gives the production of pig-iron and ferro-alloys in October, and furnaces in blast. (All figures are weekly averages in thousands of tons.)

TABLE 1.—*Iron and Steel Price Index and General Summary of Pig-iron and Steel Production.*

Period.	B.o.T. Price Index, 1938 = 100.			Iron-ore output.	Imported ore used.	Coke sent to blast-furnaces.	Pig-iron, ferro-alloys prod.	Scrap used in steel prod.	Steel (incl. alloy).			
	Iron and steel.	Coal.	Basic materials excl. fuel[1]						Imports.[2]	Prod. ingots, castings.	Delivrs. finished steel.	Stocks.[3]
1956	296	453	542	312	272	264	253	216	27	397	318	1,444
1957	328	488	537	325	303	270	275	220	14	417	322	1,444
1958—June ..	341	497	478	274	258	222	243	201	8	374	303	1,543
July ..	341	498	474	256	235	209	227	165	9	316	236	1,623
August	341	497	475	233	233	203	221	147	9	299	227	1,637
Sept.[4]	341	496	470	271	241	211	231	198	6	369	279	1,621
Oct. ..	341	509	473	294	237	215	242	195	4	364	—	1,610

TABLE 2.—*Average Weekly Production of Steel Ingots and Castings during October*, 1958. (*Thousands of Tons.*)

District.	Open-hearth.		Bessemer.	Electric.	All other.	Total.		Total ingots and castings.
	Acid.	Basic.				Ingots.	Castings.	
Derby, Leics., Notts., Northants, and Essex ..	—	4.3	13.9 (basic)	1.8	0.1	18.8	1.3	20.1
Lancs. (excl. N.W. Coast), Denbigh, Flints, and Cheshire	1.7	36.5	—	2.4	0.3	39.6	1.3	40.9
Yorks (excl. N.E. Coast and Sheffield)								
Lincolnshire	—	41.0	—	—	0.1	41.0	0.1	41.1
North-East Coast	0.5	64.4	—	1.1	0.3	64.8	1.5	66.3
Scotland	2.1	33.8	—	2.1	0.1	36.4	1.7	38.1
Staffs, Salop, Worcs., and Warwickshire ..	—	13.8	—	2.5	0.6	15.3	1.6	16.9
S. Wales and Mon.	2.6	80.4	3.7 (basic)	0.9	0.1	87.3	0.4	87.7
Sheffield (incl. small quantity in Manchester) ..	7.6	28.7	—	9.6	0.3	44.4	1.8	46.2
North-West Coast	0.1	1.7	3.8 (acid)	0.5	0.1	6.0	0.2	6.2
Total	14.6	304.6	21.4	20.9	2.0	353.6	9.9	363.5
September, 1958[4]	17.5	306.5	21.2	21.1	2.3	358.1	10.5	368.6
October, 1957	20.0	364.2	25.3	25.3	3.0	424.7	13.1	437.8

TABLE 3.—*Average Weekly Deliveries of New Non-alloy and Alloy Finished Steel.* (*Thousands of Tons.*)

Product.	1956.	1957.	1957.	1958.	
			Sept.*	Aug.	Sept.*
Non-alloy steel:					
Ingots, blooms, billets, and slabs[5]	4.7	5.0	5.1	3.1	3.8
Heavy rails ..	9.7	11.2	11.5	6.8	9.2
Sleepers	1.1	1.3	1.3	0.3	0.2
Fish and soleplates	0.7	0.8	0.9	0.5	0.9
Plates:					
(i) ¾ in. and over	30.3	34.0	35.4	27.6	28.7
(ii) Under ¾ in. ..	19.9	20.3	20.2	15.2	17.4
Other heavy prod.	50.3	53.0	54.7	29.5	34.9
Ferro-concrete bars	7.8	8.8	10.2	6.0	7.9
Wire rods	22.9	23.3	25.5	16.8	23.3
Arches, etc. ..	10.1	11.0	11.5	7.2	7.8
Other light sections	41.4	38.8	39.0	21.4	29.1
Bright steel bars ..	8.0	7.0	7.4	4.5	6.2
Hot-rolled strip ..	24.5	23.1	24.5	16.5	24.5
Cold-rolled strip ..	7.5	7.1	7.8	4.8	7.2
Sheets, incl. coated:					
(i) Hot-rolled ..	15.0	13.0	13.7	8.6	10.9
(ii) Cold reduced	24.8	29.1	29.6	32.1	31.0
Tinplate:					
(i) Hot dipped	15.9	11.3	11.9	5.7	9.1
(ii) Electrolytic		7.5	9.9	7.2	11.9
Blackplate ..	1.3	1.0	1.2	0.5	0.9
Tubes up to 16-in.	26.2	23.1	23.6	15.4	20.1
Tube, pipe fittings	0.5	0.5	0.5	0.3	0.4
Tyres, wheels, etc.	4.6	5.1	5.1	3.2	4.6
Forgings (exc. drop)	3.0	3.1	3.2	2.2	2.7
Steel castings ..	4.5	4.6	5.0	3.1	4.5
Tool, and magnet	0.3	0.3	0.3	0.2	0.3
Total	335.0	342.3	359.0	238.7	297.5
Alloy steel	17.3	17.8	20.3	11.2	16.5
Total deliveries from UK production[6] ..	352.3	360.1	379.3	249.9	314.0
Add: Imported finished steel ..	19.5	9.6	9.3	5.0	5.7
	371.8	369.7	388.6	254.9	319.7
Deduct: Intra-industry conversion[7] ..	55.2	48.1	50.3	28.6	42.1
Total deliveries new material	316.6	321.6	338.3	226.3	277.6

TABLE 4.—*Production of Pig-iron and Ferro-alloys during October* 1958.

District.	Furnaces in blast.	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total
Derbys, Leicester, Notts. Northants, and Essex	20	—	20.1	19.4	0.2	—	39.7
Lancashire (excl. N.W. Coast), Denbigh, Flints, and Cheshire ..	7	—	20.9	—	—	1.4	22.3
Yorks (excl. N.E. Coast and Sheffield)	—	—	—	—	—	—	—
Lincolnshire ..	10	—	42.6	—	—	—	42.6
North-East Coast	18	3.5	43.9	—	—	0.8	48.2
Scotland	7	0.5	13.7	1.4	—	—	15.6
Staffs., Salop, Worcs., and Warwickshire	5	—	5.5	1.4	—	—	6.9
S. Wales and Mon.	11	3.7	46.2	—	—	—	49.9
Sheffield	2	—	3.2	—	—	—	3.2
North-West Coast	6	13.5	—	—	—	—	13.5
Total ..	86	21.2	196.1	22.2	0.2	2.2	241.9
September, 1958[4]	84	23.7	186.1	18.8	0.2	2.1	230.9
October, 1957 ..	96	32.5	225.9	22.4	0.6	4.1	285.5

[1] Used in non-food manufacturing industries.

[2] Weekly average of calendar month.

[3] Stocks, mainly ingots and semi-finished, at the end of the year and months shown.

[4] Five weeks, all tables.

[5] Other than for conversion into any other form of finished steel listed.

[6] Includes finished steel produced in the UK from imported ingots and semi-finished steel.

[7] Material for conversion into other products also listed in this table.